THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

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GAS PURIFICATION
BY
OXIDE OF IRON.

COOKE BROS.,
CENTRAL DEPÔTS:
CO. DONEGAL, IRELAND;
LONDON DEPÔT:
BLACKWALL, E.;
OFFICES:
26, 27, & 28, FENCHURCH ST.,
LONDON, E.C.

GENUINE TORBAY PAINT
And SPECIAL GASOMETER PAINT.
Several Prize Medals. Established over 20 Years.
These Paints are now used in over 200 Country Gas-Works, and by all the London Gas Companies, on Gas-holders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov. 2, 1866.*
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Works: BRIXHAM, TORBAY.

THOMAS PROUD,
BROOKFIELD GAS APPARATUS WORKS,
103, ICKNIELD STREET EAST, BIRMINGHAM.
CONTRACTOR FOR
LAYING MAINS
FOR
Gas, Water, & Sanitary Purposes,
AND MANUFACTURER OF
WOOD GRIDS
FOR
SCRUBBERS AND PURIFIERS.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a Prize Medal was awarded at the Great Exhibition of 1851, for "Gas-Retorts and other Objects in Fire-Clay," and they were also awarded at the International Exhibition of 1862, the Prize Medal for "Gas-Retorts, Fire-Bricks, &c., for Excellence of Quality."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
Jos. Cowen & Co. are the only Manufacturers of Fire-Bricks and Clay Retorts at Blaydon Burn.

JOHN RUSSELL & CO.,
LIMITED,
Established at the commencement of Gas Lighting,
Manufacturers of
TUBES AND FITTINGS.
THREE PRIZE MEDALS,
Paris, 1878.
Head London Office:
145, QUEEN VICTORIA STREET.
ALMA TUBE-WORKS, WALSALL;
OLD PATENT TUBE-WORKS, WEDNESBURY.

JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
Manufacturers of
WET AND DRY GAS-METERS,
Licensees and Manufacturers of
HUNT'S
PATENT COMPENSATING METERS,
STREET-LAMPS, &c., &c.
Established 1830.

THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM,
Manufacturers of
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
Sugar, Saltpetre, and all kinds of Pans.
Roofs, Girders, and Bridges, and General Smith's Work.

THE
"OTTO" GAS-ENGINE.
See Page 146.

CROSSLEY BROTHERS,
MANCHESTER AND LONDON.

THE
NITSHILL COMPANY'S
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
AGENT:
JAMES M'KELVIE,
HAYMARKET,
EDINBURGH.

GEORGE GLOVER AND CO.,

HAVE REMOVED TO MORE EXTENSIVE PREMISES,
RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.

The want of gaslight, caused by the freezing of Wet Meters, is a very general source of complaint, and it is acknowledged that all attempts to remedy the evil have proved futile.

The want of gaslight during the dark, foggy weather of mid-winter, when gas is most needful, is a source of great loss both to Gas Companies and the public. The convenience and economy of gaslight is so great, compared with any other artificial light; that there is no valid ground for believing that it can be supplanted, and, until coal becomes many times dearer than at present, it must remain the cheapest and most convenient source of light and heat. It is especially to be regretted, when Gas Companies are making every exertion to remove all just grounds of complaint, and, as far as possible, to consult the public convenience, that the annoyance caused by smoky and unsteady flames, or the total extinction of the lights, consequent on the freezing of wet meters, should induce the public to lend a ready ear to the fallacy of the electric light as a substitute for gas.

The destructive influence of the expansive force of water while freezing is familiarly known in the bursting of water-pipes during frost; but the injury to Wet Gas-Meters, although quite as real, being internal, is not so apparent. The internal parts of Meters which have been frozen are warped or ruptured, and they frequently receive further injury by the hasty and unskilful method of thawing them, which often melts the solder as well as the ice, unfastening the bearings or other parts of the Meter, thus admitting of gas passing unregistered. Meters, once frozen, should be thoroughly repaired, and, as soon as convenient, replaced by **properly made Dry Meters** which register correctly, and with the action of which the most intense frost does not interfere.

Of course water in Dry Meters or watches will freeze, but its accidental presence in either is very rare, and there is no excuse for its being in them. More than one parent has been startled by finding his little hopeful experimenting with his watch in the wash-hand basin, and more than one stupid person has been found pouring water into a Dry Meter. Water may also get into Dry Meters by placing them below the level of the main, and connecting the service pipe at the lower part of the main, allowing water to flow into the Meter. Another means of getting water into Dry Meters is by foolishly placing them in connection with Wet Meters, the vapour from which condenses in the Dry Meters. Some water may also find its way into Dry Meters when they have been put in the place of Wet Meters, before clearing the internal pipes and fittings from water that had been deposited in them by evaporation from the Wet Meters.

The presence of water in Dry Meters is so rare and exceptional that it is properly ignored. Water is a necessity in the Wet Meter; but is incompatible with the Dry Meter. No Gas Company or Consumer suffers loss or inconvenience from frozen water in Dry Meters; but it cannot be ignored that many Companies and thousands of Consumers have suffered, and are suffering, serious loss and inconvenience from the freezing of Wet Meters, and some few Companies are suffering from the use of so-called Self-Regulating Meters, through which all the gas can be got unregistered, by inclining the Meter forward either accidentally or with the intention to defraud—a subject deserving the serious attention of such Companies.

SILVER MEDAL, PARIS EXHIBITION, 1867.

LLOYD AND LLOYD,

ALBION TUBE-WORKS, BIRMINGHAM,

AND

COOMBS WOOD TUBE-WORKS, HALESOWEN,

MANUFACTURERS OF

WROUGHT-IRON TUBES AND FITTINGS,

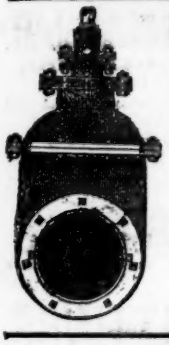
AND

LAP-WELDED IRON AND HOMOGENEOUS METAL BOILER TUBES,

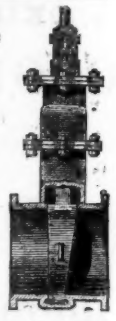
UP TO FOUR FEET IN DIAMETER.

London Offices: No. 4, Cloak Lane, Queen Street, E.C.

Warehouses: London, Liverpool, Manchester, and Lille.



C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves have taken the place of the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.

MIDLAND IRON-WORKS,

DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

EDWARD E. CROMBIE & CO.,

INVENTORS AND PATENTEES

OF THE

FRICTIONLESS DRY GAS-METERS,

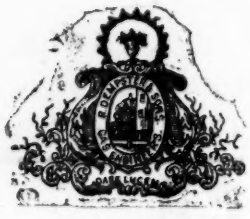
Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

METROPOLITAN WORKS, DIANA PLACE, EUSTON ROAD, LONDON, N.W.



ROBT. DEMPSTER & SONS,

GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

ROSE MOUNT IRON-WORKS, ELLAND, YORKSHIRE.

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS;

CONTRACTORS FOR THE

ERECTION OF PUBLIC AND PRIVATE GAS-WORKS.

Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

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THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

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WEDNESBURY, STAFFORDSHIRE.

WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;

LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;

HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.

GAS-FITTERS TOOLS, VALVES. COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM.

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

RICH. H. TAUNTON & HAYWARD,

MANUFACTURERS OF

WROUGHT-IRON GAS, WATER, & STEAM TUBES & FITTINGS,

STAR TUBE WORKS, HENEAGE STREET, BIRMINGHAM.

HYDRATED PURIFYING MATERIAL.

Samples on application.

MESSRS. SPENCE BROS., LIMITED,

Will be glad to supply the above on the most favourable terms, and to treat, by Purchase or Exchange, for Spent Oxide.

PRICES ON APPLICATION.

ALSO PATENT DRY COPPERAS FOR EXTRACTING AMMONIA.

VICTORIA CHEMICAL WORKS, BRADFORD, NEAR MANCHESTER.

SULPHATE AMMONIA.

R. W. WALLACE & CO.,

60, MARK LANE, LONDON, E.C.,

Are Buyers of SULPHATE AMMONIA in Large or Small Quantities, or Sell on Commission for Gas Companies and Makers.

PLANT ERECTED ON THE LATEST AND MOST APPROVED PRINCIPLE.

AGENTS to THE GASLIGHT AND COKE COMPANY, LONDON, for the SALE of SULPHATE AMMONIA. Works: BECKTON.

THE

STANDARD WASHER AND SCRUBBER.

[KIRKHAM, HULETT, AND CHANDLER'S PATENT.]

Some of the advantages claimed for this Apparatus are as follow:—

The Exposing of a large Amount of Effectually-wetted Surface (which is continually reproduced) to act upon the Gas.
Unerring Regularity in the Distribution of the Liquor.
Saving of Expense in Providing and Exchanging Scrubbing Material—none being required.
Economy of Space, thus enabling the Apparatus to be protected from the Weather.
Economy of First Cost and of Maintenance.
It works without Pressure.
It is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured.

Applications for Prices, &c., to be made to

Messrs. KIRKHAM & HERSEY, GAS ENGINEERS, 21, ABINGDON STREET, WESTMINSTER.

GAS PURIFICATION

BY

OXIDE OF IRON.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

JOHN WM. O'NEILL, Managing Director.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER AND BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM (Established 1765),

MANUFACTURER OF

TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST-IRON TANKS FOR DITTO.

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS.

WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

AND ALL KINDS OF WROUGHT-IRON WORK.

Drawings, Specifications, and Estimates supplied on application.

ALDER AND MACKAY,

MANUFACTURERS OF

IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES OF THE HIGHEST EXCELLENCE.

Original Manufacturers of Dry Meters in Cast-Iron Cases.

STATION-METERS, EXPERIMENTAL-METERS, PHOTOMETERS, & PRESSURE-GAUGES, &c.

GRANGE WORKS, EDINBURGH.

GOLDSMITH'S PATENT SIGHT WATER-LINE INDICATING GAS-METER,

MANUFACTURED BY GUEST AND CHRIMES,

FOUNDRY AND GENERAL BRASS WORKS,

ROTHERHAM;

AND 85, SOUTHWARK ST., LONDON, S.E.

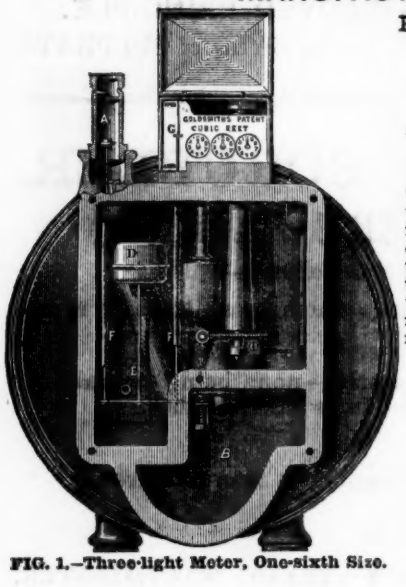


FIG. 1.—Three-light Meter, One-sixth Size.

Fig. 1 is a Meter with front removed to show the arrangement and connection of the Indicator and Valve.

Fig. 2 is front view of Index, with cover up.

The principal object of this invention is to render the water-line in the reservoir at all times visible. It will be seen, by reference to the illustrations, that this is accomplished in the following manner:—On the dial are the words "Open" and "Shut," and attached to the float is the pointer G, which rises and falls with the water-line in the reservoir. If the pointer is at "Open," it shows that the valve is open, and that the reservoir is full. If it is at "Shut," it shows that the reservoir is empty, and that the gas will be shut off.

The following ADVANTAGES will be obvious:—

1. The Inspector can see at a glance if the Meter requires water.
2. No more water than is required need be added, and therefore no water has to run out.
3. The Meter Inspector will be spared a great deal of his most objectionable work, and he will save a great deal of time and trouble.
4. The consumer will not always have to be asked for water, nor will he have to endure the unpleasant smell caused by waste water being run out.

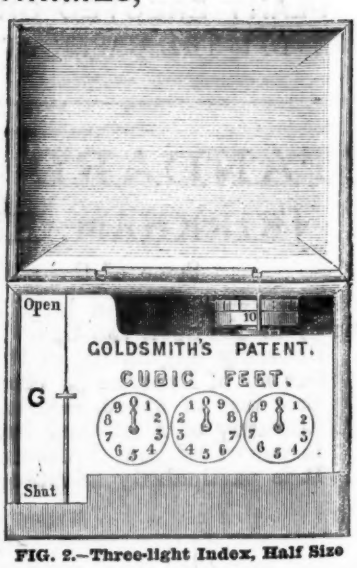


FIG. 2.—Three-light Index, Half Size

GEORGE ORME & CO.,

ATLAS METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET AND DRY GAS-METERS,

STATION-METERS, GOVERNORS,

PRESSURE AND EXHAUST REGISTERS,

LAMP-METERS IN CAST-IRON BOXES

And every Description of Gas Apparatus.

J. T. B. PORTER & CO.,

GAS ENGINEERS & MANUFACTURERS,

IRONFOUNDERS AND CONTRACTORS,

GOWTS BRIDGE WORKS,

LINCOLN.

LONDON OFFICES: 1, WESTMINSTER CHAMBERS, S.W.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.

REFERENCES TO 500 WORKS ALREADY ERECTED.

N.B.—All Communications to be addressed to the FIRM ONLY.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS,

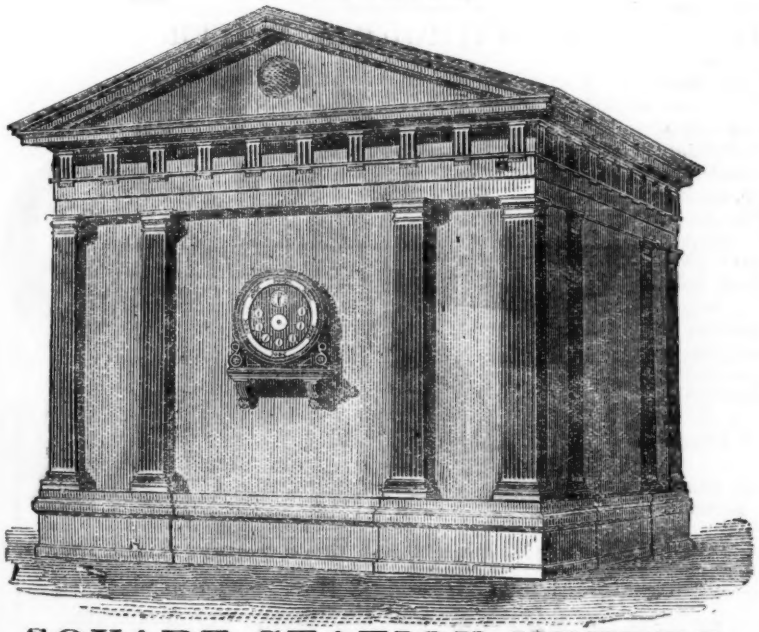
OF THE HIGHEST EXCELLENCE ONLY;

ALSO LICENSEES AND MANUFACTURERS OF

WARNER & COWAN'S PATENT SELF-REGULATING GAS-METERS;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c. ON APPLICATION.

C. & W. WALKER'S

WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,
DONNINGTON, NEAR NEWPORT, SHROPSHIRE.
FINSBURY CIRCUS, LONDON.

ESTABLISHED IN 1860.

BENJAMIN CARPENTER,

THE ORIGINAL MANUFACTURER OF THE IMPROVED

WOOD SIEVES

FOR

GAS PURIFIERS & SCRUBBERS.

PROVIDENCE WORKS,
22, HERMES STREET, PENTONVILLE ROAD
LONDON, N.

MOBBERLEY & PERRY,

FIRE CLAY and BRICK WORKS,

STOURBRIDGE.

Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAY.
Manufacturers for Home and Export.
GAS-RETORTS, GLASS-HOUSE FURNACE,
BLAST-FURNACE, TANK BRICKS, LUMPS, TILES,
And Every Description of Best Fire-Bricks.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

GRIRDROD'S PATENT

PORTABLE PIPE SCREWING

MACHINE,

For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.

In use at the chief gas-works, and giving great satisfaction.

For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

W. H. BAILEY & CO.,

Brassfounders, Gauge Injector and Tool Makers,
ALBION WORKS, SALFORD,
LANCASHIRE.

Gold Medal Awarded, Paris Exhibition, 1878.

THOMAS TURTON AND SONS,

SHEAF AND SPRING WORKS,

SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS,

STEEL OF ALL DESCRIPTIONS,

SCREW STOCKS, TAPS, AND DIES, SPANNERS
RATCHET BRACES, LIFTING-JACKS,
ANVILS, VICES,
AND ENGINEERS TOOLS GENERALLY.

LONDON OFFICE:

90, CANNON STREET, E.C.

R. W. WINFIELD AND CO.,

CAMBRIDGE STREET WORKS AND ROLLING MILLS,

BIRMINGHAM.

The following Medals have been awarded:—

GRAND COUNCIL MEDAL, LONDON, 1851. MEDAL, LONDON, 1862. GOLD MEDAL, PARIS, 1867,

The only Gold Medal awarded for "Apparatus and Processes for Heating and Lighting" by the Imperial Commissioners

MEDAL FOR PROGRESS, VIENNA, 1873.

The following Medals were also awarded at Paris, 1878:—

GOLD MEDAL for Chandeliers and Gas-Fittings.

GOLD MEDAL (Rappel) for Metallic Bedsteads and Furniture.

GOLD MEDAL (Rappel) for Art Metal Work. BRONZE MEDAL for Tube Metal and Wire.

MANUFACTURERS OF BRASS AND COPPER SHEETS,

TUBE AND WIRE,

ROLLED METALS, LOCOMOTIVE AND CONDENSER TUBES, CYLINDERS;

Ornamental, Taper, and Cased Tubes; Tin Tubes;

GAS-FITTINGS, CHANDELIERS,

BRACKETS FOR HEATING AND LIGHTING;

METALLIC BEDSTEADS.

Ecclesiastical and Mediæval Metal Workers.

GENERAL BRASSFOUNDERS.

REGISTERED TRADE MARK:

LONDON OFFICES & SHOW-ROOMS: R. W. W. & CO. 141, FLEET STREET, E.C.

THE

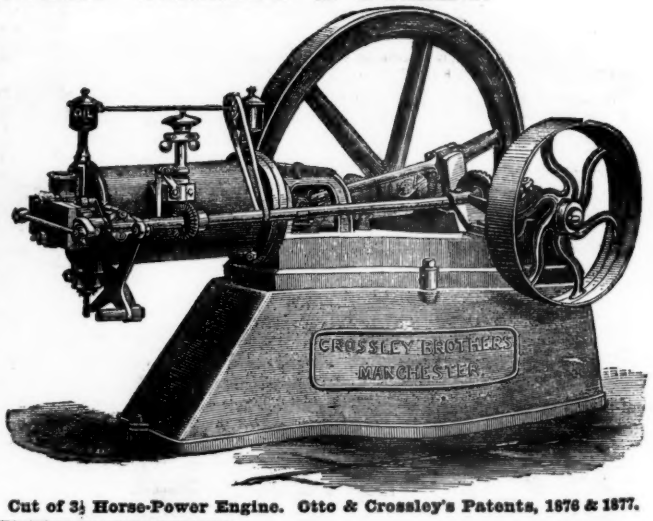
New "OTTO" Silent Gas-Engine.

AN ENGINE WHICH WORKS WITHOUT A BOILER.

The principle of combustion in this Gas-Engine is ENTIRELY NEW. In it an explosion does not take place in the ordinary meaning of the term. A small part only of the charge is combustible, which on ignition serves to expand the remainder, thus avoiding shock and effecting great economy. The Engine is also alone in the peculiarity of igniting its charge at the *beginning* of the stroke, leaving the whole of the stroke for effecting expansion of the gases, instead of merely a fraction as in obsolete constructions.

This Engine has a SMALLER NUMBER of MOVING PARTS than any other Gas-Engine; or, indeed, than many steam-engines. It is almost as silent as a steam-engine, works with the same smoothness and regularity of speed, and has the immense additional advantages of always being ready to start at full power at once on the gas being lighted; and, by dispensing with the boiler, of avoiding the danger of explosion, increased rates for insurance, expensive attendance, and all the annoyance which the use of a boiler entails.

Where work is intermittent, trouble with a small steam-engine and boiler is at its maximum, but at its minimum with a Gas-Engine.



Cut of 3½ Horse-Power Engine. Otto & Crossley's Patents, 1876 & 1877.

Sizes at present offered . . . . 1, 2, 3½, and 8 Horse-power nominal.
Being equal to about . . . . 1½, 2½, 4, and 12 Horse-power maximum.

Cost of Gas, One Penny per hour per indicated Horse-power, at 4s. per 1000 cubic feet.

PRICES, LIST OF USERS, AND BOOK OF SEVENTY TESTIMONIALS, ETC., ON APPLICATION TO

CROSSLEY BROTHERS,

WORKS: GREAT MARLBOROUGH STREET, MANCHESTER;

LONDON WAREHOUSE: 116, QUEEN VICTORIA STREET, E.C.

SOLE ENGLISH AND COLONIAL MAKERS.

TANGYE BROTHERS AND HOLMAN,

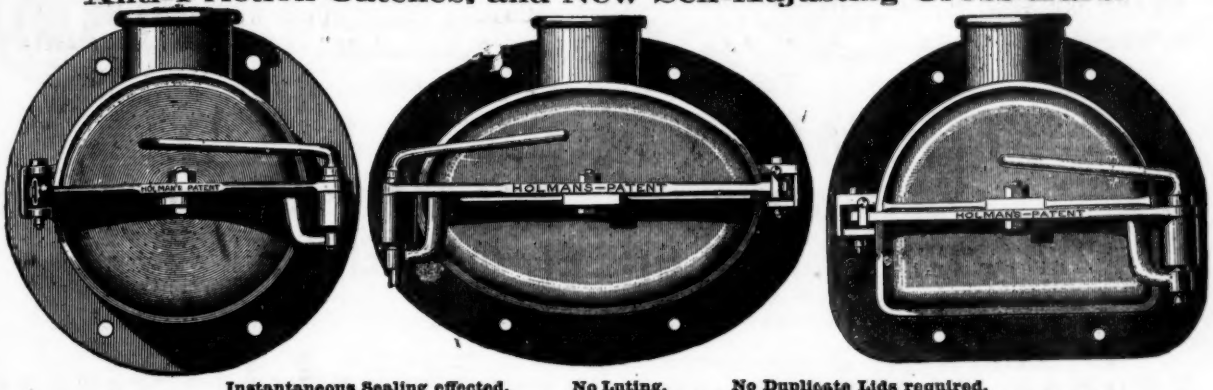
CORNWALL HOUSE, 35, QUEEN VICTORIA STREET, LONDON, E.C.,

(LATE OF 10, LAURENCE POUNTNEY LANE.)

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.

D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.
And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1878.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

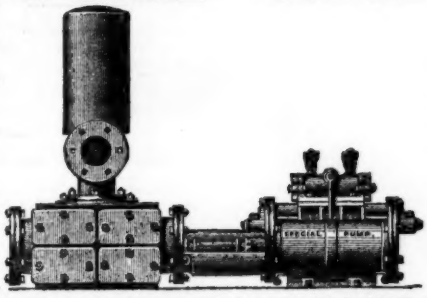
Yours truly,

(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION.

THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4	2	9	815	18
5*	2½	12	1,250*	20
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.

TANGYE'S HIGH-PRESSURE AND CONDENSING STEAM-ENGINES; CORNISH, VERTICAL, & TUBULAR BOILERS
HYDRAULIC AND SCREW LIFTING-JACKS, CRABS, PULLEY-BLOCKS, &c.

FULL PARTICULARS, ESTIMATES, CATALOGUES, ETC., ON APPLICATION.

London, 1851 New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.

(ESTABLISHED 1816)

ARE THE ONLY MAKERS

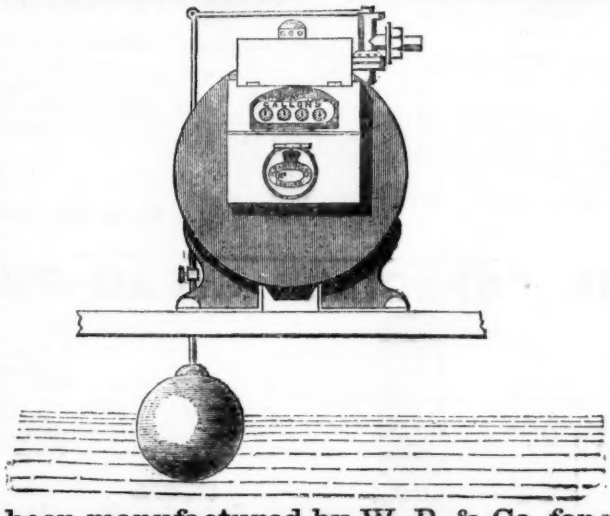
OF THE

LOW-PRESSURE WATER-METER.

These Meters will register with perfect accuracy, either at full speed, or with a few drops only passing through them.

They must be placed over the cistern to be supplied, and the water, after being measured, will fall from the outlet into the cistern below. Each Meter is fitted with a ball-valve, so made that it can be adjusted to shut off the supply at the inlet when the water reaches any required height in the cistern.

The 100-gallon Meter is fitted with a cistern holding about three or four gallons, and may be fixed inside a house, free from the effects of frost, and requires no attention after once being fixed.



From "The Engineer," April 6, 1877.

"Low-pressure Meters have been found to register with almost perfect accuracy, or, at all events, within 5 per cent. either for or against the consumer, and from the nature of their construction are by no means easily deranged. Still, even the low-pressure meters have their disadvantages, but these are chiefly as respects the question of first cost, seeing that they must have a cistern fixed at a higher level than that at which the supply is needed. All things considered, however, the balance of opinion rules at present in favour of the low-pressure Meter, and they are consequently increasing in favour as time goes on."

These Meters have been manufactured by W. P. & Co for more than 25 years, and are largely used by the following and other Water Companies:—

NOTTINGHAM, DERBY, LEICESTER, SUNDERLAND, GREAT YARMOUTH, SHEFFIELD, NORWICH, LOWESTOFT, COVENTRY, SOUTHEND.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

J. R. C.—*Thanks for letter received. We are making inquiries on the subject and will write you shortly.*

H. M'G.—*Next week.*

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 4, 1879.

Circular to Gas Companies.

On Friday evening last, the new system of street illumination by means of gas was extended, by the lighting up of the interval between Pall Mall and Piccadilly Circus by some of Mr. Sugg's improved lanterns and burners, similar to those which the Phœnix Company have introduced with so much success in the Waterloo Road. This, it must be understood, has been done by the liberality of the Chartered Company. The appearance of the thoroughfare so illuminated seemed to us to be simply magnificent. We were particularly struck with one thing—a new gas lantern has been placed immediately opposite one of the best-lighted windows in Howell and James's establishment, and this, to our view, contributed a large amount of radiance to the goods displayed, notwithstanding the fact that a number of burners were employed in lighting up the window. The great success of these lighting experiments is unquestionable, but the unpleasant fact remains, that, if the new system be adopted, it must be followed by a considerable addition to the expense of our public lighting. This additional expense, however, is nothing like equal to that which the enemies of Gas Companies would have us believe. Full details of the cost of the old system and that of the new one now inaugurated will be found in another column; but we may here refer to a few patent facts. Waterloo Place has hitherto been illuminated by forty-two lamps, each consuming two and a half feet per hour—the gas, it must be understood, is cannel. Thus the total amount of gas consumed in these lamps amounted to one hundred and five feet, which, at 4s. 4d. per thousand, costs 5½d. per hour. Now we have introduced to our notice lamps giving an illumination equal to from eighty to two hundred candles, in which gas is consumed at a total rate, for the whole system in Waterloo Place, of eight hundred and sixty-six cubic feet per hour, the cost of which is 3s. 6½d.* Will the niggardly Vestries endure this? There are two sorts of public lighting to be considered. For ordinary streets, the present lamps are sufficiently effective; but there are localities in which a much larger amount of light is required, and in these spaces the new system is calculated to furnish all the illumination desired. Piccadilly Circus, perhaps, never looked so bright as it did on Friday evening; but whether the Parish will consent to pay the cost of the additional light, when the Gas Company discontinue their gratuitous supply, remains to be seen.

We report in another column so much as we think necessary of the lecture on "Gas Illumination," delivered by Dr. W. Wallace, F.R.S.E., at the Society of Arts last Thursday evening. It was little more than a *réchauffé* of the report that the Doctor made for, and which was read at the Dublin meeting of the British Association last August, and afterwards published in our columns. We allude to the lecture more particularly to mention the fact, that the large room of the Society was lighted by two of Mr. Sugg's new burners, and thus we had an opportunity of judging of their effect in illuminating interiors. We believe that every one in the room was highly gratified with the result, and an important future may be predicted for these lamps and burners, in lighting up large business establishments. If, so far as our visual memory helps us, we compare the lighting of Messrs. Shoolbred's shops, by means of the electric light, we have no hesitation in expressing a confident opinion, that such lamps and burners as those displayed last Thursday, in the lecture-room of the Society of Arts, afford a much more agreeable and effective illumination.

One of the first public experiments with lighting by means of electricity has not turned out to be satisfactory. The Markets Committee of the Corporation of the City of London have decided on discontinuing the use of the electric light in Billingsgate Market. The light gave satisfaction to no one, for it was not calculated to display to the best advantage the quality of the fish offered for sale. Then, again, Billingsgate Market, on a cold winter's morning, is not exactly an agreeable place, even when brisk business is being done. The fish salesmen, who walk backwards and forwards in front of their stalls, and are not required to take much active exercise, missed the genial warmth which is afforded by the combustion of gas, but which is lacking when electricity is used as the illuminant. The occupants of the market were far from being happy while the electric light was employed; now, however, that such an efficient substitute as the lamps shown at the Society of Arts has been introduced, the Corporation can have no hesitation in adopting the new lanterns and burners. Light superior, in our minds, to that afforded by means of electricity, will be given; warmth will be restored to the chilly atmosphere, and all will again go well.

Let us here remark that a great deal too much is made of the presence in the atmosphere of the products of the combustion of gas. They are, of course, of no consequence in Billingsgate, where a whirlwind carries them instantly away. We refer more particularly to houses in which gas is burned, and we challenge the most enthusiastic "sanitarian," as he is called, to show that carbonic acid does the smallest harm. If we watch the habits of the lower animals, we find them instinctively sleeping, under circumstances which must promote an increase of carbonic acid in the atmosphere, and at the same time add a quantity of air repeatedly breathed. But they do very well under these conditions, and if they are well fed, we do not believe that their lives are at all shortened.

Some alarm is being felt that the introduction of the electric light will depreciate the value of Corporation securities—at all events of those possessing gas undertakings. Holding, as we always have held, that the indebtedness of our large Corporations amounts to sums, which we regard as perfectly unjustified, we are bound to say that the stability of investments in corporate bonds is not at all likely to be affected by the advent of the electric light. Birmingham, for example, we consider is overloaded with debt, but so long as the Corporation can screw out of the consumers high prices for gas, it looks as though the Corporation will continue in a prosperous condition. If, however, the electric light should succeed in establishing itself, and methods are devised for producing it at a limited cost, the gas profits of the

* This week we give a full description of the experiment, and in our next issue we shall give illustrative drawings of both the burners and the lanterns.

Corporation must necessarily be greatly reduced. They need not fear that Parliament will ever grant a monopoly in the production and distribution of the electric light. Every one having a large establishment, or even with a private house, will be left perfectly free to illuminate his factory, warehouse, shop, or private dwelling by means of the electric light, if he find it answers his purpose to do so. We do not think many will; but we have to consider possible eventualities. Here, in the Metropolis, several tradespeople have adopted the light, but how long they will maintain it remains to be seen. At the present moment, the Corporation of Birmingham mulct the gas consumers to the extent of £25,000 a year, which, they state, is applied in relief of rates, and which simply means that the consumers have been taxed to that extent in addition to the impost fixed on non-consumers. Notice has been given that a reduction of 3d. per thousand feet will be made immediately. This will give to the consumers an apparent benefit of £30,000 a year; but it is clear to everybody that this is a mere delusion. The price of gas in Birminghan should have been reduced at least 6d. per thousand feet. The consumers would then have had their rights, and the ratepayers would have been subjected to their legal responsibilities.

The speeches of Dr. Phelps, at the half-yearly meetings of the Cambridge Gas Company, have always a peculiar interest. Without wishing to give offence, we may say that there is, in our opinion, no Chairman of a Gas Company who possesses the scientific knowledge which enables him at once to grasp the questions constantly arising in connection with Gas Companies, and the business knowledge which helps him to look into the future, and judge correctly what effects the inventions, which are every now and then brought forward, may have on the future of Gas Companies. Dr. Phelps's last address was very naturally devoted to an account of the electric light, and its possible influence on the fortunes of Gas Companies. Like ourselves, the learned Doctor has no expectation that the new illuminant will ever affect the interests of the old one, which, for nearly seventy years, has so well supplied the wants of the public. The speech will, we are assured, be perused by our readers with interest.

The Corporation of Newcastle-on-Tyne have resolved on opposing the Bill promoted by the Newcastle and Gateshead Gas Company. The latter seek for some very unimportant alterations in their present Acts—alterations which, in our mind, will little benefit the Company. As a matter of course, the Company will now be brought under the sliding scale, and they will ask for the initial price of 3s. 4d. per thousand feet. At the present time they are charging 2s. 9d., and that the Corporation desire shall be the standard. Again, the Company wish to supply fifteen-candle gas, tested by the "London" burner. To-day they supply fourteen-candle gas, tested, we rather think, by a peculiar burner which keeps down the illuminating power of the gas; but the Corporation desire sixteen-candle gas. Consequently, the use of the "London" burner might allow the Company, if they so willed, to lower the quality, while it was nominally raised. No one, however, outside the Town Council, imagines that the Company would do so mean an act. There is a question, too, about the amount of sulphur impurity to be allowed. The Company ask for a twenty-grain maximum, and the Town Council desire to limit them to ten. Altogether, we are not inclined to think that much will come of this opposition. Petitions to both Houses have been prepared, and the necessary meetings under the Borough Funds Act, 1872, will shortly be held.

Sulphur continues to be in excess in the gas supplied from the Kensal Green station of the Chartered Company. To the great disgust of the Metropolitan Board of Works, the Chief Gas Examiner, on appeal, has decided that the excesses were owing to some loose valves in the purifiers. This is, in one respect, an important matter, for the explanation is, that the valves had been loosened by the vibration caused by the Great Western Railway trains. It may point to the inadvisability of placing gas-works in close proximity to a railway over which heavy traffic is continually passing.

The Corporation of Salford having for many years starved their gas-works, have now set resolutely to work to make up for past deficiencies. In another column will be found a description of the first instalment of the improvements which have been completed. We think they will give entire satisfaction, and do great credit to their Engineer, Mr. Samuel Hunter.

A very important decision has been given by the Master of the Rolls—one which may be of considerable interest to Gas Companies. The Great Eastern Railway Company undertook the manufacture of locomotives, and sold them to the Tilbury and Southend Railway Company. Not one of the Acts of the Company gives them power to manufacture locomotives for sale, and the Master of the Rolls granted an injunction, restraining the Defendant Company from continuing the manufacture of locomotives, except for use on their own line. It was, he said, against public policy to allow a Railway Company to carry on the business of letting for hire, or making rolling-stock, which the Legislature had not authorized them to do. We fear that a similar decision would be given in case a Gas Company made, and let for hire, cooking and heating stoves, gas-engines, furnaces, &c., except under the powers of a special Act.

We are favoured to-day with a valuable letter from our correspondent, Mr. J. F. Nicholson—a gentleman who is well acquainted with gas and other modes of illumination. He has been making a long sojourn in Paris, and while there, devoted himself to the study of the merits and cost of the electric light. He sums up the conclusions he has arrived at in the last paragraph of his letter, which we quote below:—

> To conclude, when we consider the difficulty of the regular transmission of the electric current, owing to the resistance of the best conducting medium; its capacity for storeage; the lower diffusive illuminating power of the light as compared with gas; the dark shadows it throws,—deeper in proportion to the intensity of the light; its pale, sickly, glistening whiteness, so unbearable unless subdued by opal shades; its flickering, unsteady wavering character, and, above all, its great cost—when, I say, we consider all these objections fairly and dispassionately, it seems to me, that gas shareholders need not yet be disheartened, nor should common sense invite them, *en désespoir*, to hastily dispose of their property at a sacrifice.

It is interesting to note that one of our most eminent electricians, Mr. Preece, has expressed a general agreement with the conclusions of Mr. Nicholson. Without being, so far as we know, at all connected with Gas Companies, he still expresses a confident opinion that Shareholders have nothing to fear from the competition of the new illuminant.

We said, some weeks ago, that neither of the Bills promoted by the two Companies who desired to obtain from Parliament the monopoly of the supply of the electric light, had any chance of success this session, and now we are not astonished to learn that one of them—that promoted by the National Electric Light Corporation—has been withdrawn. The Bill had altogether too wide a scope. It asked for power to distribute electricity for lighting purposes all over the country. If it had gone forward, it would have been opposed by every Gas Company and Corporation in the kingdom. The Directors of the National Electric Light Corporation have, therefore, done wisely in avoiding a parliamentary contest, which, we expect, they will never again attempt to provoke. The Bill of the Electric Lighting Company, which has passed the Examiners, is a less ambitious measure. It only proposes to deal with the Metropolis; and when the parliamentary strength of the Metropolitan Gas Companies is considered, together with the certainty that the Bill will be opposed, at a later stage, by the Corporation of the City of London and the Metropolitan Board of Works, it will be seen how very hopeless is its case.

Water and Sanitary Notes.

Dr. Tidy continues to report favourably on the general condition of the water supplied by the Metropolitan Companies. In the month of January he found but few instances in which water slightly turbid had been furnished; the waters being in other respects much as usual. The even quality of these waters must strike most observers as something remarkable, and the fact goes a long way to explain their value for dietetic purposes. It is when violent changes are produced in the amount of solid constituents other than organic matter, that bad effects on health are produced. It is to be hoped that London will long continue to enjoy the supply of water which has scarcely its equal.

Perhaps it cannot be said that the present is the best time for the Corporation of Cardiff to purchase the undertaking of the Water-Works Company. There is much distress in the borough; and although we may feel certain that, in the long run, the inhabitants generally will profit by the possession of the works, the ratepayers start with affright at seeing a large addition made to the indebtedness of the Corporation. If it be true, as Alderman Winstone stated at the last meeting of the Town Council, that the expenditure of some thousands for improvements would soon increase the debt to over a million of money—which would be thirty times more than they had property to meet—it is evident that the Council must look out for some substantial addition to their security. The purchase of the water-works would undoubtedly furnish this; but it is yet to be seen whether the ratepayers and owners will sanction the transaction. The town's meeting, under the Borough Funds Act, 1872, is to be held in a few days, and we shall then learn the opinion of the inhabitants on the matter.

The Birmingham Corporation are suffering from a drought of

water like the Corporation of Liverpool, and for the same reason. Being in fear of their pipes freezing, the consumers leave their taps partially open, and hence an enormous waste of water is the result. It is to be regretted that we have no simple apparatus which, when applied to the pipes, will prevent their freezing. All outdoor pipes ought, of course, to be jacketed, and, for the rest, the service-mains should be buried so deep as to be free from any danger of freezing, except in case of long-continued and intense frost. The Birmingham Corporation have issued a minatory notice, which, we hope, will have the effect of making consumers more careful in preventing waste.

The general impression amongst the ratepayers at Richmond and Kingston does not appear so favourable to the carrying out of Lieut.-Col. Haywood's scheme of drainage, as we could wish. The Select Vestry of Richmond seem, in fact, to be strongly opposed to it; and at a meeting of the inhabitants of Kingston, a few days ago, the majority of the speakers seemed to hold opinions adverse to the scheme. The proceedings, however, in the latter, were adjourned. Two topics were most discussed —the one being the necessity of separating the rainfall from the sewage; and the other was the quality of the land which Lieut.-Col. Haywood has selected to carry on a system of intermittent downward filtration. This land, it is repeatedly said by many persons, is water-logged, and many consider it quite unfit for irrigation purposes. This, we believe, is true of only a small portion of it, and no doubt the objection might be removed by skilful drainage. There are others who object to the situation of the proposed outfall for the filtered sewage. The question of the separation of the rainfall from the sewage would, if the scheme were carried out, prove economical. It is true that rain is required for flushing drains; but a quantity sufficient for that purpose falls upon the roads and the roofs of houses, and then passes rapidly into the drains and sewers.

The inhabitants of Liverpool have always had some trouble in disposing of their unsaleable town refuse, and their difficulty has lately greatly increased, in consequence of the town tips having been closed. Another locality on which to deposit the refuse has, therefore, had to be discovered, and Mr. G. F. Deacon has found one, having an area of 117,000 acres, near the mouth of the Mersey, in which the water is from 90 to 108 feet deep. To this spot it is proposed to carry the refuse in "hopper" barges, and Mr. Deacon calculates that, at the present rate of increase, all the refuse of the borough will only cover the bottom of the area to the extent of an inch in a hundred years. At this rate, it is not likely to constitute another bar in the Mersey, nor would there appear to be any danger of the Corporation filling up the Irish Sea with their rubbish. It seems that the quantity of unsaleable refuse produced in Liverpool reaches 119,000 tons, or about 141,440 cubic yards, per annum, while the cost of its removal amounts to 3s. 5½d. per ton.

The date of the resignation of Major Graham, the Registrar-General, has not been fixed, but it is expected to arrive shortly. Very many persons are beginning to fear that his resignation will give occasion for the perpetration of a "job." Dr. Farr, who would have been his natural successor, is in bad health, and, it is said, will be unable to assume the duties of the office. We have never admired Dr. Farr, but we are bound to say that he possesses a larger knowledge of the duties of the Registrar-General's Office than any other man living. We regret, therefore, to find that the state of his health may preclude him from taking the appointment.

The decision of Baron Pollock in the case of *Hill and Others v. The Metropolitan Asylums Board*, in respect of the Hampstead Small-Pox Hospital, we regard as most unfortunate. It was never, in our opinion, proved that the hospital was more than a sentimental grievance to the surrounding inhabitants. It is, of course, not exactly pleasant to have an hospital, intended for the reception of patients afflicted with a loathsome disease, in close proximity to dwellings. Still, it was incumbent upon the plaintiffs in this action to show that they had sustained some substantial damage. Further than the allegations, that the value of property had been depreciated by the presence of the hospital, nothing in support of their case was produced. Now, if every instance in which the value of property is depreciated by the vicinage of some institution which people in the neighbourhood dislike, is to be made the subject of an action at law, litigation will become very prevalent, and lawyers be enabled to reap a good harvest. Gas Companies would often be victimized in such cases, and it would become almost impossible to set up manure works in any part of the kingdom. We are happy to see that the case will, if necessary, be carried through all the Law Courts. What the result will eventually be, we are, of course, prevented from predicting.

MORE LIGHT.

Two things have been abundantly made clear by the recent experiments in street illumination. In the first place, the inadequate, and, in some cases, perfectly dismal lighting of most of our public thoroughfares has been brought into prominent notice; and, secondly, it has been shown that whatever can be accomplished in the way of improvements by the use of the electric light, can be successfully rivalled, and even excelled, by a larger and more judicious use of coal gas. Unquestionably, the electric light has been the cause of the demand for more light, but it is at present far from being proved that the employment of electricity is the best method of meeting such demand. Had the public recognized earlier the necessity for better street lighting, there can be no doubt that Gas Engineers would have had as little difficulty in supplying the want, as they have had in lighting the Waterloo Bridge Road and Waterloo Place, Regent Street, during the last fortnight. It is a little more difficult to account for the almost universal expression of satisfaction which has been pronounced, when the possibility of Gas Companies being superseded was contemplated. Such jubilation apparently proceeds either from ignorance or prejudice—probably both. The possessors of any form of monopoly will suffer more or less from unreasonable prejudice. Also, almost every household being familiar with the periodical gas bill, which is generally classed with other inevitable expenses—such as rent, taxes, and water-rates—the Gas Companies are largely looked upon as the incarnation of a necessary evil, and their representatives receive about as much sympathy as the tax collectors.

The Vestries, in the matter of light, ever tender of the ratepayers pockets, have been in the habit of reducing the expenditure for street lighting to the lowest possible limit—a limit so low, in fact, that in some of our suburban roads it would make little practical difference if the gas-lights were altogether extinguished. If the ratepayers desire more light, they must, from whatever source it is obtained, be prepared to pay more for it. But, apart from the question of cost, it can be conclusively shown that, of all the illuminating agents at our command, coal gas is the one which, in the most satisfactory manner, meets the exigencies of street lighting. The lighting of any thoroughfare, to be successful, must be uniform. It will not do to have sections of the road brilliantly illuminated (excepting where such is especially required), while other portions are left in deep shade or darkness; and hence the value of each lighting centre must be judiciously proportioned to the distance intervening between light and light. Lights of very great intensity, except for busy spots and crossings, must be deprecated as wasteful. Now, the combustion of coal gas can be made small or great, with this considerable advantage, that the proportionate illuminating power will remain practically constant Thus, if ten cubic feet of gas is burnt through a suitable burner, where previously we have only been burning five feet, we may rely upon getting double the amount of light in the former case. The application of this is obvious. If at any point in a series of lamps it is advisable to have an increased light, it is only necessary to increase at that point the consumption of gas. The lighting of the public streets might be increased to almost any extent; but the point must be determined when an amount of illumination is arrived at which will be sufficient for all practical purposes. No doubt, the greater the light the better the effect, and a road never looks so well lighted as when a large number of gas illuminations are burning; but such a result is a very extravagant and totally unnecessary one.

In determining the amount of illumination sufficient for all purposes, the circumstances of each case should be judged upon its merits. All roads do not require to be lighted to the same extent, nor even all parts of the same road. Wherever considerable traffic is carried on after dark, good lighting is a necessity, and it may be that such lighting would be a wasteful extravagance elsewhere. Also at the intersections of streets, at busy corners, and in such spaces as Piccadilly and Oxford Circuses, powerful centres of light would be of the greatest advantage. For an ordinary street or road it will probably be found that a number of smaller lights closer together are to be preferred to fewer lights of greater brilliancy. The shorter the distance between light and light, the less loss of light takes place. Lights equal to sixteen candles in illuminating power, placed twenty yards apart, are equal, in the general illumination of a thoroughfare, to lights of twenty-five candles placed twenty-five yards apart. The height of any light from the ground, and the character of the lantern in which it is enclosed, are of no small importance. In most of the ordinary lamps the darkest part of the street is usually to be found immediately beneath the lamp-pillar, owing to the dark shadows thrown downwards by the

framework of the lantern. This is readily obviated by changing its form, and it is remarkable that the present type of lamp-post and lantern should have survived so long.

The two experiments with gas already referred to as now being carried on—the one in the Waterloo Bridge Road by the Phœnix Gas Company, under the direction of Mr. Woodall, their Engineer; and the other in Waterloo Place, Regent Street, by The Gaslight and Coke Company, under the superintendence of Mr. Sugg, of Westminster—have caused the previous remarks to be written. These experiments differ in themselves, but are each eminently successful. The length of road lighted is the same in each case—viz., 500 yards. Previously to the recent alteration, the section of the Waterloo Road chosen—from the bridge to the South-Western Railway Company's terminus—was perhaps one of the most dismal specimens of street illumination that could well be found. There were twenty-two gas-lamps in all, including six at the intersection of the York Road; each of these gave a light, or was supposed to give a light of about twelve candles, or a total illuminating power of 264 candles. Sixteen of these lamps have now been replaced by forty-eight of the new ones, each fitted with a burner giving a light of fifteen candles — that is to say, the distance between light and light has been reduced one-third, the illuminating power, at the same time, being increased. The lamp-columns have been reduced in height about two feet, and the old lanterns replaced by new ones, which are glazed at the top with opal glass. This transmits, as well as reflects, a large portion of the light, and at the same time abolishes, to a great extent, the usual shadow beneath the lamp. The six lamps previously at the York Road crossing have been replaced by two columns, placed, one in the centre of each of the two existing refuges, and each supporting a new form of lantern, octagonal in shape, enclosing large Argand burners, made by Mr. Sugg, the one giving a light of 130 candles, and the other of 200 candles. At the end of the road, next the bridge, the old posts being at distances of 40 yards apart, have not been removed, but have been fitted with Argand burners of 50-candle power each, and lights of similar value have been fixed at the four corners of the intersecting roads near the still larger lights. The idea has been to give, along the length of the road generally, an illustration of good lighting by ordinary lamps properly designed, and sufficiently near together, and at certain spots to concentrate the light where special brilliancy is an advantage. The effect produced is striking, as compared with the lighting of the other parts of the district, and the road has now at night the appearance of a well-to-do prosperous thoroughfare. As a rough test of the general illumination, it may be stated that an ordinary newspaper can be read in any part of the road.

With respect to the cost, Mr. Woodall furnishes the following figures:—The total cost, according to the old plan, was £93 10s. per annum, or 5¼d. per hour.

The New System.

Cost of lanterns, posts, burners, fixing, &c.	£120	0	0
Interest on first cost at 10 per cent. . . .	£12	0	0
Cost of lighting, cleaning, repairing, &c., at 15s. per lamp per annum, the price paid to the Company	40	10	0
	£52	10	0
Gas—48 burners at 6 ft. per hour = 288 ft.			
8 „ 15 „ „ = 120 „			
2 „ 35 „ „ = 70 „			
Total . . . . . 478 ft.			
per hour, which, multiplied by 4200, the number of hours during which lamps are alight in the year, gives 2,007,600 cubic feet, which, at 3s. 4d. per 1000 feet, is. .	334	12	0
Total per annum	£387	2	0

Thus the cost of gas used in lighting a broad road, 500 yards long, amounts to 19d., and the total cost, including maintenance, to 22d. per hour. It is proposed, in the event of the continuance of such a scheme of illumination, to extinguish one-half the number of lamps at midnight, and this would reduce the cost to 14d. and 17d. respectively.

It will be seen, from the consideration of the above statement, that, by the new plan, the cost of such lighting is trebled, and it will probably be found that this represents about the minimum amount of improvement in street lighting which it would be advisable to attempt.

The second experiment of this nature, being carried out in Waterloo Place, Regent Street, is of a more lavish kind. Here the whole of the street-lamps, 42 in number, have been crowned with a new form of lantern, hexagonal in shape, glazed, as in the previous case, with opal glass, and each lantern is fitted with Sugg's double-ring steatite Argand burners, consuming twenty cubic feet per hour, and giving a light equal to eighty standard candles. The refuge lamps in Piccadilly are fitted with triple-ring burners, consuming twenty-three feet of gas per hour, and giving a light equal to one hundred candles. The two lanterns, one between the Athenæum and the United Service Club Houses, and the other before the County Fire Office, are fitted with still larger burners, each having four concentric steatite rings, and consuming forty-five cubic feet per hour, and giving the light of two hundred candles. A disadvantage in this experiment occurs from the necessity of using the old columns, which are somewhat too short for the new lights, and are placed irregularly upon the footways. This, of course, could be readily obviated if the lights are permanently adopted. The statement of cost of gas furnished by Mr. Sugg is as follows:—

According to the Previous Arrangement.	Equal to Feet.	*According to the Present Arrangement.*	Equal to Feet.
36 footway lamps, at 2½ cubic feet per hour	90	Ditto, at 20 feet	720
4 refuge lamps, at 2½ cubic feet	10	Ditto, at 23 feet	92
1 lamp between the Club Houses, at the same . .	2½	Ditto, at 45 feet	45
1 lamp opposite the County Fire Office, at the same .	2½	Ditto, at 45 feet	45
Total	105	Total	902
105 cubic feet at 4s. 4d. per 1000 = 5½d. per hour.		902 cubic feet at 4s. 4d. per 1000 = 3s. 11d. per hour.	

The gas used in Waterloo Place is cannel gas—*i.e.*, is equal to twenty standard candles when tested under the parliamentary conditions. A fact which is noticeable with regard to these larger burners of Mr. Sugg is, that a greater proportionate increase in illuminating power is obtained by an increased consumption of gas. Thus the "London" standard Argand burner gives, per cubic foot of gas consumed, an illuminating power of 3·2 candles; with the fifty-candle burner this figure is raised to 3·4, and with the hundred and two hundred candle burners respectively to 3·6 and 3·8. It need hardly be said that Waterloo Place is in this manner most brilliantly lighted—lighted, indeed, in such a manner as must satisfy the most sceptical as regards the possibilities of gas lighting.

There are few thoroughfares, however, even in the Metropolis, which call for such a display as this, and it seems probable that any permanent improvement in our street lighting will be rather on the lines of the experiment in the Waterloo Road. The fact has been shown, and those who run may read, that to obtain all that can by any means be deemed necessary, or even luxurious in public illumination, there is no need to appeal to any other source than the various Gas Companies. The ratepayers must decide if more light is required; then the cheapest and best method of obtaining it will be to consume an increased quantity of coal gas.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

CLXVII,

THE TREATMENT OF RESIDUAL PRODUCTS.

DETERMINATION OF BOILING POINTS (*Continued*).

Determinations of the boiling points of naphthas, and the percentages of benzole in them, can be rapidly and safely made in the apparatus seen in the engraving, fig. 2. By its use the operator can

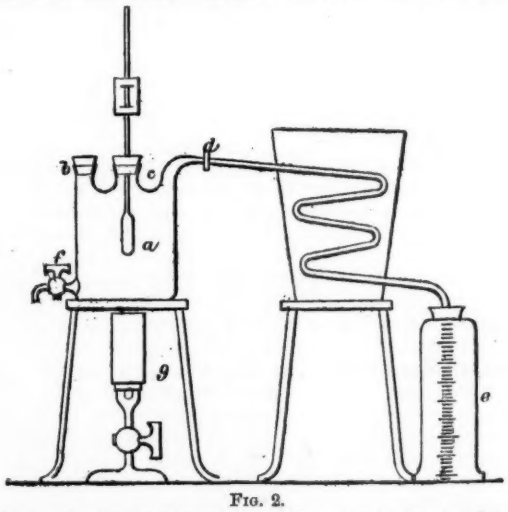


FIG. 2.

test five or six samples in an hour; and, owing to the complete condensation which is effected by the worm, there is little or no loss of the more volatile constituents of the naphtha.

A copper retort, *a*, is constructed with four apertures. One of these, *b*, which may be closed by means of a cork, serves to allow of the insertion of the charge. The central one, *c*, is also fitted with a cork, through which passes the stem of a thermometer. If the latter is

not furnished with an enamelled scale, so as to render the column of mercury more evident, the same end may be accomplished, almost equally well, by adapting a piece of paper to it, as shown in the engraving. The retort is attached by a screw coupling, at *d*, to the worm, which is to be cooled by water in the usual way. The perfect action of the coupling, *d*, is the only thing in the apparatus which requires care. A leak in it would, of course, render all the results made with it valueless. It is not necessary that the worm should have many coils; but it is most important that they should have the proper slope, so that no liquid should remain in it at the end of the operation. For this reason a flat zig-zag, as in the illustration, placed in a flat condenser, is preferable to a worm. The distillate is to be received in the graduated cylindrical bottle, *e*. The residue remaining in the retort can be removed at the end of the distillation by the tap, *f*. The retort is heated by means of the Argand burner, *g*, which is supplied with gas by a vulcanized india-rubber tube, as at *e* in the illustration, fig. 1, chap. clxvi. It is usual, in this case, so to adjust the position of the thermometer that its bulb is about one-quarter of an inch above the liquid at the commencement of the distillation.

The retort may have a capacity of about 10 fluid ounces. The receiver, *e*, should hold 10 fluid ounces, and be graduated into 100 parts. Supposing a benzole determination is to be made, the receiver, *e*, is to be filled with the sample up to the 100th division, and this quantity is to be transferred to the retort by the aid of a glass funnel inserted at *b*. The cork is then to be replaced, and heat applied. When the mercury in the thermometer reaches 100° C. = 212° Fahr., the gas is to be turned off, and the cork, *b*, is to be loosened to admit air, and, consequently, permit the contents of the worm to drain properly. This will be unnecessary if the worm is sufficiently large in its internal diameter. As soon as no more fluid drops into the receiver, the percentage may be at once read off.

The joints of the retort must all be made by brazing, as the boiling points of heavy naphthas have frequently to be determined, and thus danger would be incurred if soft solder were employed.

It must be remembered that the distillation of so volatile and inflammable a liquid as benzole is never absolutely free from danger; and if, for example, through carelessness, the cork, *b*, were not inserted before commencing the operation, or, if there were any leaks in the apparatus, a serious accident might happen.

It is to be particularly observed, more especially when glass retorts are used, that effectual condensation is of great importance. Benzole vapour is so excessively inflammable that, if it reaches flame, it "fires back" like a train of gunpowder. It is this property of volatile hydrocarbons which makes it imperative that the fireplaces of the pitch stills, to be described further on, should be as far as possible from the naphtha-still house.

It will be seen that in both the arrangements for the determination of the boiling points of naphthas which have been given, a large portion of the column of mercury in the thermometer escapes being heated by the vapour of the fluid distilling. Now, as thermometers, in the process of graduation, have the entire column heated, it is evident that we have here a source of error. A formula is given, in works on physics, for the correction of this error; but it is never, it is believed, used in tar distilleries. Where it is desired to attain great accuracy, it is better to prevent the error in the first place than to apply corrections which are always more or less uncertain. Fortunately, this is easily done by the employment of retorts of the shape shown in fig. 3. It is only necessary to select one with a neck of sufficient length. The operator has only to see that the whole of the mercurial column is, at the boiling point of the fluid, at or below the neck of the retort by which the vapours escape.

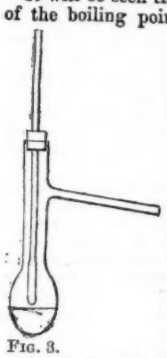


Fig. 3.

Fractional Distillation.

When a mixture of several liquids has to be separated into its constituents, by taking advantage of the differences in their boiling points, we employ a process called fractional distillation. It is, in fact, by this process that the work of the tar distiller is principally accomplished. One of the earliest to devise an apparatus for facilitating the separation of the coal tar hydrocarbons was Mr. C. B. Mansfield. The main object which he had in view was the preparation of benzole from coal naphtha. It is dependent on the principle that every homogeneous fluid boils at a constant temperature, unless it decomposes during the operation. Water is such a fluid, and as its boiling point is 100° C. = 212° Fahr., it is exactly suited for the preparation of commercial benzole, which, as we have said, consists of those hydrocarbons of coal tar which boil below 100° C.

The principle involved in Mansfield's still (fig. 4) is very simple. The outer chamber, *b*, is to be filled with water, and the naphtha is placed in *a*. The neck of the still having been connected with a suitable condenser, heat is to be applied to *a*. As soon as it boils, the vapours passing through *c* are condensed by the cold water in *b*, and, consequently, nothing distils over. But the vapour in condensing parts with its heat to the water, which gradually gets hotter and hotter, and at last boils. As soon as the water reaches a temperature of 80° C. = 176° Fahr., the benzole begins to distil; but, when the water boils, it still remains at 100° C.; consequently, the hydrocarbons, boiling at a higher temperature, condense as they come in contact with the sides of the head, and fall back. This apparatus was a great boon at the time of its invention, but, owing to the large size of the head, the vapours in the centre escaped contact, and were carried over; the operation had, consequently, to be repeated several times, thus involving loss of time and fuel. The principle is perfect, but the method of applying it requires modification. It is not, however, a difficult problem to solve. The writer has contrived an apparatus for the separation of fluids whose boiling points are near together, which has, in his hands, succeeded admirably. Up to the present time he has confined its use to coal-tar products. When the formulæ of two chemical substances differ by CH_2, they are said to be homologous, and the boiling point of the one with CH_2 more than the other is higher. Let us take the case of benzole, C_6H_6, and toluole, C_7H_8. Benzole boils at 80° C. = 176° Fahr.; and toluole at 111° C. = 232° Fahr. We have only to contrive an arrangement where the vapour of the mixture shall play against a surface, which never rises higher in temperature than 80° C. = 176° Fahr. It is evident that, to fulfil this condition, the vapour must come in contact with a vessel containing benzole. The apparatus seen in the engraving (fig. 5) enables this to be done. It may be made of any size, it costs little to construct, and it does not get out of order. All the parts are of brass or copper, fastened by brazing.

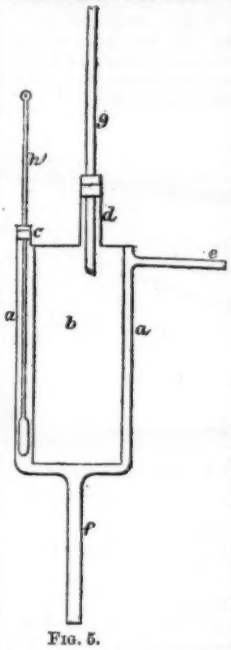


Fig. 5.

The cylinder, *a a*, through which the vapours pass, contains a smaller one, *b*, which is partially filled with benzole. At *c* is an opening to allow of the passage of a thermometer; it should be long enough to reach the bottom of the outer cylinder. In a small apparatus, such as is used in the laboratory, it may be fixed in its place by means of a cork; but, in a large rectifying still, it must be attached by a screw coupling. Large thermometers are generally protected by means of a perforated brass tube. They may be obtained of any size at the instrument maker's. The inner chamber, *b*, has an opening at *d*, admitting the tube *g*; the latter is in its turn connected with a worm or other convenient cooler. The benzole is thus condensed, and continually returned to *b*. The tube *f* is connected with a flask in laboratory operations, or a still when used in the factory. The distilled product is conveyed to another condenser by means of the pipe *e*.

The principal points upon which the successful use of this apparatus depends are, firstly, that the distance between the inner and outer chambers is not too great; and, secondly, that the distillation is not carried on too rapidly. Of course, care must be taken that the condenser for the benzole in the inner chamber is effective. Other contrivances for the separation of heavy from the light oils and naphthas will be described further on.

Specific Gravity.

By the term "specific gravity" is understood the relative weight of equal volumes of any substance. Thus, if we were to weigh a gallon of water, we should find it to be exactly balanced by 10 lbs.; if, then, we replaced the water by the lightest runnings from the still of purified coal naphtha, boiling at 80° C. = 176° Fahr., we should find the gallon to weigh 8½ lbs. These numbers express the relative densities or specific gravities; water being 10, the benzole is 8½. But, both in science and commerce, it is the invariable rule to take water as unity. Adopting this plan, and expressing the results in decimals, we have for the specific gravity of water 1·000, and benzole 0·850. But, as liquids expand by heat, and different liquids to a different extent, we must make our experiment at a known temperature. It is usual, in this country, to take 15·5° C. = 60° Fahr., as a convenient, and, as rule, easily obtainable, temperature.

In the illustration given above, we have described a rough way of determining a specific gravity, by weighing a gallon of water against a gallon of benzole. This method of weighing, if performed with suitable apparatus, is capable of great precision. In tar distilleries the specific gravities of oils and naphthas are always taken by means of a little glass instrument called a hydrometer. It consists of a hollow glass spindle, containing a strip of paper having the specific gravities marked on it. The liquid to be tried is placed in a tall glass, and warmed or cooled as may be necessary, until it stands at 15·5° C. = 60° Fahr. The spindle is then placed in the liquid, and the specific gravity read off.

Instead of direct specific gravities, it is very common, in many parts of England and Scotland, to adopt Twaddell's scale. They are easily convertible into each other by the following formulæ. Let a = the degree as given by Twaddell's hydrometer, and x = specific gravity in relation to water, taken as 1·000. To convert the degrees of Twaddell's scale into specific gravity, we have—

$$x = 1 + (a \times \cdot 005)$$

To convert specific gravity into degrees of Twaddell, we have—

$$a = \frac{x - 1}{\cdot 005}$$

(To be continued.)

Communicated Article.

APPARATUS FOR THE MANUFACTURE OF THE AMMONIA CONTAINED IN GAS LIQUOR INTO SOLID CARBONATE OF AMMONIA, WITHOUT THE USE OF ACIDS.

By Mr. F. W. Brothers.

In July, 1875, Mr. R. O. Paterson and myself, in making some experiments, found that, by a very simple process, the ammonia contained in gas liquor could be formed into solid carbonate. After securing letters patent for the invention, we erected apparatus, a sketch of which is here given, to manufacture between two and three tons of carbonate per week.

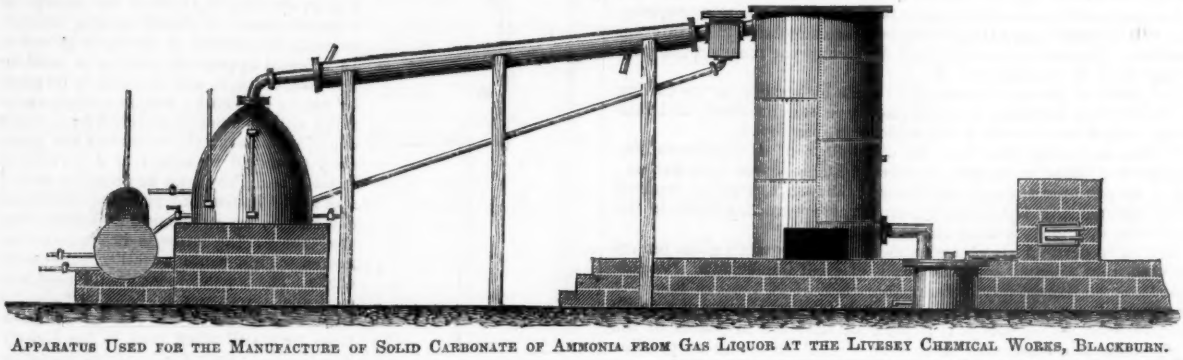
As far as concerns the production of a crude sesqui-carbonate of ammonia, the process employed was a perfect success, the resulting carbonate containing over 26 per cent. of ammonia. The cost of coal and labour was about £2 for each ton of carbonate produced.

The anticipations that this crude carbonate might, by sublimation, and treatment with charcoal, be converted into the ordinary sesqui-carbonate of ammonia, have not been realized.

The apparatus, as will be seen, is of simple and inexpensive construction. It consists of a balloon-shaped boiler, connected by a Liebig condenser to a wrought-iron receiver. At the outlet of the receiver is placed a water-bath, and connected to the bath is a furnace to consume the sulphuretted hydrogen. There is also a second boiler used, to treat the liquor after it has been treated in the first.

In order to prevent any liquid from entering the receiver—in case the liquor should boil over—a catch or intercepting-box is placed on the inlet to the receiver. This box is constructed with a diaphragm, and is connected by a return-pipe to the boiler. A thermometer is placed at the inlet to the receiver. Liquor being run into the boiler, heat is applied, preferably by means of a steam coil. The sulphuretted hydrogen and carbonic acid gases, together with the ammonia and aqueous vapours, pass up the Liebig condenser, which is so constructed, and subjected to such control, that the excess of aqueous vapour condenses, and falls back again into the boiler. The gases pass into the receiver, together with aqueous vapour sufficient to form, with the carbonic acid and the ammonia, solid carbonate on the inside surface of the receiver. The carbonic acid being in excess, breaks up any sulphide of ammonium, and forms carbonate, the sulphuretted hydrogen passing through the receiver into a furnace, where it is consumed. The liquor, after the gases have been driven out of it in the first boiler, is run into a second, where the remaining ammonia which it contains is driven out, condensed, and used to purify the gas, and again becomes carbonated.

It appears to me that such a sure, easy, and cheap method of working up into solid carbonate the ammoniacal liquor in gas-works abroad should recommend itself to the gas profession, and especially as the carbonate would find a ready market in England, for the manufacture of sulphate of ammonia. In future, therefore, there need be no occasion for the great waste of ammonia at works where acids cannot be obtained.



Apparatus Used for the Manufacture of Solid Carbonate of Ammonia from Gas Liquor at the Livesey Chemical Works, Blackburn.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

GAS *VERSUS* ELECTRIC LIGHT IN PARIS.

Sir,—It will probably interest those of your readers who hold gas property, to peruse the following statement I have drawn up, respecting the relative merits of illumination by gas and by the electric light, deduced from observations I have made during a sojourn of several weeks in Paris.

It appears that the price of a share in the Paris Gas Company, who, as most of your readers probably know, have the monopoly of supplying gas to the City, was, on the 1st of January last year, 1318 frs. 75 c., the original value represented by each share being only 250 frs. The price of shares rose steadily until the 5th of February, when they were quoted at 1365 frs. During March, April, May, and June, they declined, being on the 11th of June at their lowest quotation—1247 frs. 50 c. From the latter date, however, they recovered tone, rising gradually till the 6th of August, when they reached 1345 frs. The price varied but little till the 8th of October, when the shares were quoted at 1315 frs. They then continued to fall until the 12th of November, when they were quoted as low as 1190 frs. On the 1st of December they again revived, being then quoted at 1215 frs., and closing at 1270 frs. on the 24th (the last date furnished to me), at which date they were only 95 frs. below their highest quotation in the course of 1878. The dividend paid during the year was 68 frs. 40 c. per share.

On taking the comparative value of the shares of the Société Générale d'Electricité, I find that, when issued on July 9, 1878, they were quoted at 925 frs. each, their real value, however, being 500 frs. Between this price of 925 frs. and their highest, 1080 frs., as quoted on the 24th of September, they continued to fluctuate during October, November, and December, falling as low as 790 on the 10th and 17th of December; but, again recovering tone, they reached, on the 24th (the last quotation with which I was favoured), 835 frs. They have, therefore, depreciated in value as much as 290 frs., with an almost steady decline and only partial recovery, and have not yet yielded a farthing dividend.

This striking difference in the marketable value of gas and the electric light occurred when the latter was blazing in all its intensity, and exciting the admiration and wonder of the dazed multitude who thronged Paris during the period of the Exhibition. I must say my fears were aroused lest a very different result should be shown when I sat down to make this comparative inquiry, after having heard the merits of the electric light so largely extolled, and being piteously informed by my friends that the days of gas were numbered.

Again, I naturally expected that the Municipality of Paris would gladly renew their contract with the Electric Light Company, and that gas would be completely extinguished for street lighting. In this I was mistaken, for the report presented to the Municipal Council by the Lighting Committee (for the publication of an early translation of which in the Journal we are greatly indebted to you) states that the Committee could not recommend the adoption of the contract proposed by the Electric Light Company, owing to the extravagant cost of the light, and would only countenance its use for another year (not for three years, as proposed), and on condition of its being supplied at about the same price as that charged for gas—viz., 30 c. (3d.) per lamp per hour—and in addition to this reduction of price, "the Company will have to bear all the expenses incidental to the re-lighting of the gas-lamps each night, at the time of the cessation of the electric lighting (midnight); or, in the event of an extinction taking place, during the whole period of such extinction." The Committee also declined to sanction the Company's application to be allowed to supply electricity for the lighting of private establishments.

We shall look with anxiety to the comparative trial of the two lights in Paris, as the Municipality propose to test their respective merits and cost. Gas, however, is not yet superseded, nor will it, in my opinion, be regarded as non-essential for illumination. It is still in daily use, in conjunction with the electric light, in the Magasins du Louvre, and at midnight, when the new light is exhausted, the Authorities still fall back upon gas to do the greater part of the lighting of even the Avenue de l'Opéra and other places, where the grand display of the electric light is made. In Paris, therefore, gas is not superseded; on the contrary, both modes of lighting are employed together—one for its intensity, when economy is not the chief object in view; the other for furnishing the readiest, cheapest, and most manageable light with which we are acquainted.

Gas remains, so to speak, in reserve, perfectly reliable for supplying the casual deficiencies that may at any moment unexpectedly arise to arrest the motive power, or derange the machinery that generates the electricity, or vitiate, interfere with, or break off the transmission of the current. Nor are the chances and risks of such interruption inconsiderable or infrequent, seeing that skilled electricians are required to keep the elaborate apparatus in thorough working order. I have not yet seen a single steady electric light in this City—all are continually wavering.

To conclude, when we consider the difficulty of the regular transmission of the electric current, owing to the resistance of the best conducting medium; its incapacity for storeage; the lower diffusive illuminating power of the light, as compared with gas; the dark shadows it throws—deeper in proportion to the intensity of the light; its pale, sickly, glistening whiteness, so unbearable unless subdued by opal shades; its flickering, unsteady, wavering character; and, above all, its great cost—when, I say, we consider all these objections fairly and dispassionately, it seems to me, that gas shareholders need not yet be disheartened, nor should common sense invite them, *en désespoir*, to hastily dispose of their property at a sacrifice.

Paris, Jan. 27, 1879. John F. Nicholson.

TURBIDITY OF WATER IN FROSTY WEATHER.

Sir,—Replying to the letter of "Clapham," in your last issue,

The cause of the turbidity of water drawn at a very low temperature is that air, like other gases, is more soluble in water at a low temperature than when warm; but when the water attains the temperature of the room, the absorbed gas escapes. Hence the change that your correspondent notices.

Zero.

Parliamentary Intelligence.

GAS AND WATER BILLS, 1879.

The Examiners continued their sitting during the past week, and found that the Standing Orders had been complied with in respect of the following Bills:—Aldrington Water; Altrincham Gas; Birmingham Corporation Water; Birmingham Gas (Differential Charges Repeal); Brighton and Hove Gas; Bromley Gas; Cardiff Corporation; Crystal Palace Gas; Dearn Valley Water; Dun Drainage; East Retford Water; Exeter Corporation Gas; Glasgow Corporation Water; Glossop Gas; Grand Junction Water; Imperial Continental Gas Association; Knutsford Light and Water; Lancaster Gas; Leicester Corporation; Liverpool Lighting; Mirfield Gas; Morecambe Gas; Nelson Local Board; Newcastle-upon-Tyne and Gateshead Gas; Plymouth and Stonehouse Gas; Portsmouth Water; Rochester Corporation; Sligo Gas; Stratford-upon-Avon Corporation; Weardale and Shildon District Water; Westgate and Birchington Gas.

In the case of the Belfast Water and the Wisbech Gas Bills, the allegations of non-compliance were disallowed, and the Bills were consequently passed by the Examiners.

In the case of the South Shields Extension and Improvement and the National Electric Light Corporation Bills, the parties did not appear in support of their petitions; the Bills were, therefore, struck out of the list.

The consideration of the petitions for the following Bills was adjourned until after the meeting of Parliament:—Manchester Corporation Water; Rotherham Borough; Sligo Borough Water; Tipton Local Board.

The Bills of the Alliance and Dublin Consumers Gas Company, and the Colchester Water Company failed to comply with the Standing Orders, and will have to go before the Standing Orders Committee.

Legal Intelligence.

RICHMOND PETTY SESSIONS.—Wednesday, Jan. 29.

(Before Sir H. W. Parker, *Chairman, and a Bench of Magistrates.)*

SUPPLYING GAS TO A CLUB.

This was a case in which Mr. F. Pope, of the Richmond Club (late County Residential Club), Richmond Green, had been summoned for the non-payment of the sum of £3 15s., for gas supplied to the establishment by the Richmond Gas Company. A plea of "not indebted" was put in, on the ground that defendant had only guaranteed the amount of the gas bill in the event of the County Residential Club failing to carry out their contract with the Gas Company. The case came before the Magistrates on the 1st and 8th ult., and was reported in the Journal, pp. 14, 48, the result being that the summons was dismissed, on the ground that defendant was not the proper person upon whom distress should be levied. The Bench were, however, of opinion that action might be taken against him in the County Court.

Mr. F. B. Senior again appeared in the case, and stated that, since the Bench had given their decision, the Gas Company had laid the matter before counsel—Mr. E. Clarke—who had stated that the Justices were, in his opinion, right, and that a distress should be made upon the premises to which the gas had been supplied, and not on the property of any person who might have given a guarantee. Under these circumstances, the Company would not take further proceedings in the matter.

READING COUNTY COURT.—Thursday, Jan. 16.

(Before Mr. Vernon Lushington, *Q.C., Judge.)*

PROCEEDINGS UNDER THE RIVERS POLLUTION ACT.

Judgment was delivered this day in the matter of the action brought by the Hartley Wintney Board of Guardians, as the Rural Sanitary Authority, to restrain the Governor of the Royal Military and Staff College, Sandhurst, from allowing sewage matter to flow into the Blackwater, under the circumstances reported in the Journal for Dec. 24 last, p. 923.

The Judge said the evidence given on behalf of the Rural Sanitary Authority showed that on various occasions in 1878, sewage had passed from the College into the Blackwater by a certain pipe over or through a filter-bed, which was ineffectual to purify the sewage matter. It was proved that notice had, as prescribed by the Act, been served on the Governor of the College; and the plaint in the County Court was entered in the same style, against the Governor, without specifying any name. It appeared that General Napier was the resident Governor of the College. No evidence was given on either side as to the ownership of the College, or the conditions of General Napier's occupancy. He thought, however, it might be assumed that the land and buildings were technically vested in the Secretary of State for War, and that the Governor acted under instructions from the War Office in administering them. Some correspondence was stated to have passed in the matter, and at the last Court a letter was produced from Major Sturt, R.E., stating that the question had been referred to the War Office, who, finding after inquiry that the York Town sewage scheme had been given up, decided that a separate scheme should be prepared as soon as possible, with a view to cut off the overflow from the College filtering-tanks into the Blackwater. At the last Court, Mr. Witherington, who applied on behalf of the Governor of the College, declined to contest the pollution of the stream by sewage from the College, but submitted that the statute did not authorize the Court to issue any order in respect of the College, and that the notice was bad as not being addressed to any person by name. There was, however, a previous question which he felt it his duty to examine—viz., whether the statute did not exempt from its operation, lands vested in the Secretary of State for War. He quoted from the Rivers Pollution Act, and the Public Health Act, in regard to the subject of the action, and said there was, in his opinion, no exemption from proceedings such as had been taken under the Rivers Pollution Act, given to lands vested in the Secretary of State for War. The question then arose—Was it competent to take proceedings against the Governor of the College? The Governor was but the officer of the Secretary of State; he occupied the College solely in that capacity; and in that very matter of the sewage arrangements it could not be doubted that he acted under the instructions of the Secretary of State. It might, no doubt, be argued that the act complained of was the immediate act of the Governor and all the residents at the College, down to the domestic servants, and that, the act being unlawful, they were all liable for it to the law, as well as to their superior, the Secretary of State. But that, he conceived, would be to take too narrow a view of the facts, for the pollution of the stream was caused by the sewage of the establishment as a whole. He was of opinion that the Secretary of State was the real occupier, as well as owner of the premises; that the obligation was upon him; that he was the offender; and that consequently the proceedings should have been taken against him, and not against the Governor. He regretted that the proceedings had been taken against the wrong person, and that he was unable to direct any amendment which would cure the error, the penal character of the enactment, and the provision as to the personal notice, rendering that impossible. His judgment must therefore be for the defendant, but he should not condemn the plaintiffs in costs, as he considered they had acted *bonâ fide*, and not without reason, in the performance of an important duty, imposed upon them by Act of Parliament. He trusted that his decision would not be injurious to General Napier, who would, he presumed, be protected by the Secretary of State.

Neglecting to Pay a Gas Account.—At the Tynemouth Borough Police Court, on Monday, the 27th ult., the Tynemouth Aquarium and Winter Garden Company, Limited, were summoned for neglecting and refusing to pay the sum of £155 2s., due from them to the Borough of Tynemouth Gas Company. Mr. H. A. Adamson, who appeared for the Gas Company, said, after proving the case, he had reasons for asking that a warrant of distress should be issued at once.—The delivering of the summons at the office of the defendants having been sworn to by Detective Anderson, Mr. W. Allison, Clerk to the Gas Company, gave evidence as to the service of the notice of demand on the 9th ult., and which, therefore, expired on the previous Thursday, the 23rd ult. The money had not yet been paid.—This was all the evidence, and a warrant of distress was granted.

Unlawfully Connecting a Pipe to a Gas-Meter.—At the Bury Borough Police Court, on Monday, the 20th ult., Cyrus Heys, of Wood Street, Elton, was summoned by the Corporation for having unlawfully connected a meter with a pipe through which he was supplied with gas without giving the requisite 24 hours notice to the Corporation of his intention to do so.—It was proved that when defendant left a house in Wash Lane he owed gas arrears amounting to 16s. or 17s., and, upon taking up his abode in Wood Street, Elton, he connected the gas-pipe with the meter, without either giving the requisite notice or paying the arrears. When discovered it was found that he had burned 300 feet of gas.—Fined 20s. and costs, or 14 days imprisonment.

Fraudulent Consumption of Gas.—At the Bury Borough Police Court, on Thursday, the 23rd ult., John Ward, landlord of the Church Inn, Spring Street, Bury, was summoned by the Corporation for a breach of the Gas-Works Clauses Act.—From the evidence it appeared that on the 26th of December the defendant admitted to one of the meter inspectors that he had connected a pipe with the main, and upon the matter being reported to the Gas Committee, the Gas Manager, upon going to the defendant's house, found that he had coupled an india-rubber pipe with the inlet-pipe, and removed the meter. The defence was that Ward connected the pipe in order to improve the lighting of his house, the gas being very bad, and that he had no intention of fraud.—Defendant was fined 20s. and costs, which he objected to pay; and was told by the Bench that, if he did not, a distress would be levied on his goods.

Damaging a Gas-Meter.—At the Middlesbrough Police Court, on Monday, the 27th ult., Samuel Mears was charged with injuring the gas-meter upon his property, so as to prevent it registering the quantity of gas consumed.—John Matthews, gas-fitter in the employ of the Corporation, said he went to the defendant's shop in Black Street, as it was reported that the gas-meter was frozen. He tried it with hot water, but it would not act.—Robert Lord, gas-fitter, spoke to emptying the water out of the meter, and saw that a hole had been bored in the drum.—James Curzon, gas-fitter, deposed that the consequence of the hole being in the drum was that it would prevent the gas consumed being registered.—William Leng, inspector of meters to the Corporation, spoke to examining the meter in June, October, and on the 15th of December. It worked rightly at that time. The hole must have been made in it between the 15th and the 28th of December.—Mr. J. Booth, Gas Manager, said that the meter with the hole in the drum could not register the gas consumed. The hole appeared to have been drilled in the drum.—Defendant said three or four days after the frost set in the gas would not light. He was told to put hot water in the meter, and he did so. After that it was all right until six o'clock on the night of the 24th of December, when the gas went out. He then put in it more hot water, but it had not the desired effect, and he sent to the gas-works.—The Stipendiary said he had no doubt that the meter had been interfered with, for the purpose of preventing the registering of the gas consumed, and he could not help thinking that it was with a dishonest intention.—Fined 40s. and costs.

Miscellaneous News.

ANOTHER EXPERIMENT IN STREET ILLUMINATION.

Last Friday evening the lighting of Waterloo Place and Regent Street, London, upon an improved system, took place, and the result is acknowledged on all hands to have been an entire success. The arrangements have been carried out by Mr. William Sugg, on behalf of The Gaslight and Coke Company, and the new lanterns have been designed for the Company by him. They are all hexagonal in form, with the exception of the large lanterns, one on the post between the Athenæum and United Service Clubs, Pall Mall, and the other opposite the County Fire Office, Regent Street, which are twelve sided, and those on the safety posts in Piccadilly Circus, which are octagonal.

All the lanterns are glazed with a new kind of white glass in the tops, which serves to reflect and transmit the light. The lower portions are of clear glass, and allow the direct as well as the reflected rays of the burner to be dispersed all round. These new lanterns are perfectly shadowless.

A notable distinction between the old and new lanterns is, therefore, this: On the old system of lighting, the darkest spot in the street is usually immediately under the lantern, and it may be remarked that a number of shadows are there gathered together, thrown down by the bottom of the lantern, while the frame supporting the lantern is the cause of four dark shadows diverging from the base, and widening as they stretch away from the lantern as a centre. Under the new system the reverse is the case. The lightest spot is at the lamp-post, and there are no shadows of any kind. This suppression of the shadows will be a great advantage to riders and drivers, many accidents occurring from horses shying at the shadows from street lanterns.

During the progress of the work of fixing the lanterns, temporary burners were used. These were Sugg's "London" Argands, each with a self-acting governor affixed, in order to maintain a constant rate of consumption of gas—viz., 6 cubic feet per hour. The light given for this quantity of gas was equal to that obtainable from 24 sperm candles, of six to the pound. This lighting was of itself a very great improvement over ordinary street lighting, as small print could be read at a distance of 25 feet from the columns, and there was an entire absence of shadow.

The temporary experiment showed how great an improvement could be made in street lighting by the adoption of a somewhat similar style of lantern (but on a smaller scale), fitted with an Argand instead of a flat-flame burner.

The old burners consumed 2½ feet of gas per hour, and the light from

this quantity equalled that obtainable from 9 sperm candles. The cost per hour, for the 42 lamps included in the experiment, was as follows:—

Thirty-six ordinary lamps, at 2½ feet per hour	90 feet.
Four "safety" lamps	10 ,,
One lamp between the Athenæum and United Service Clubs	2½ ,,
One lamp opposite the County Fire Office	2½ ,,
	105 feet.

At 4s. 4d. per 1000 feet = 5½d. per hour.

The cost of lighting upon the new system, with 5-feet Argand burners on the ordinary lamps, and 50-candle burners consuming 12 cubic feet of gas per hour each on the safety posts, will be as follows:—

Four "safety" lamps, 12 feet per hour	48 feet.
Thirty-six ordinary lamps, 5 feet per hour	180 ,,
One 100-candle burner	25 ,,
One 100-candle burner, opposite the County Fire Office.	25 ,,
	278 feet.

At 4s. 4d. per 1000 feet = 1s. 1d. per hour.

The new burners now fixed in the footway lanterns are Sugg's new pattern "London" Argand burners, with two concentric columns of flame. The consumption of gas is 19 cubic feet per hour, and the light produced is equal to that of 80 sperm candles.

The safety (or "refuge") lanterns in Piccadilly Circus are fitted with Sugg's patent "London" Argand burner, with three concentrated columns of flame, consuming 23 feet of gas per hour, and giving the light of 100 sperm candles.

The lanterns between the Athenæum and United Service Club Houses, and opposite the County Fire Office, are each fitted with a Sugg's patent "London" Argand, with four concentric flames, consuming 45 feet of gas per hour, and giving the light of 200 sperm candles.

Each burner is fitted with a central jet of gas, which burns ¼ foot of gas per hour, and is always alight. This little "flash light" is maintained at a constant rate of consumption, by a very small governor of a new construction, lately invented by Mr. Sugg.

Each of the large burners is provided with its own governor, so that variations of pressure in the street mains do not in the least affect the height of flame, and the ventilation of the lanterns is such that a severe gale will not affect the steadiness of the flame.

The lanterns are not hotter, during the lighting hours, than an ordinary street lantern in which a flat-flame burner is used. Each is provided with a lever tap, so made that the burner can be lighted and extinguished without the use of a ladder. When this tap is turned on, the little "flash light" lights the burner; and when turned off, the flash only is left burning. There is, therefore, no necessity to open the lanterns to light the burners.

The cost of lighting in this manner is—

36 footway burners, at 19 feet per hour	684 feet
4 refuge lamps, at 23 ,, ,, ...	92 ,,
2 200-candle burners in the positions before mentioned	90 ,,
Total	866 feet

(giving a total illuminating power of 3680 candles) at 4s. 4d. per 1000 feet = 3s. 9d. per hour.

The gas consumed by all the burners is called 20-candle gas—*i.e.*, it gives a light of 20 sperm candles for 5 cubic feet, tested according to the Instructions of the Metropolitan Gas Referees.

CAMBRIDGE UNIVERSITY AND TOWN GASLIGHT COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held last Thursday—the Rev. Dr. PHELPS, Master of Sidney College, in the chair.

The Directors, in their report, recommended that a dividend for the half year, after the rate of 10 per cent. per annum on the consolidated stock, and after the rate of 7 per cent. per annum on the amount paid up on the new shares, be paid on the 1st of February, free of income-tax. They stated that they had decided to reduce the price of gas supplied to the public from 4s. to 3s. 9d. per 1000 cubic feet from Christmas last.

The Manager (Mr. James Weeks) reported that the works had been kept in an efficient state, and, although used to the full extent of their producing power, were found equal to the requirements of the town. The new works were progressing. The purifying-house and meter-house were ready for the reception of the roofs, the principal portions of the material for which were on the premises, and would be fixed as soon as the weather permitted. The foundations for the retort-house, and buildings in connexion therewith, were brought to the surface, and would also be proceeded with at the earliest opportunity. The illuminating power, pressure, and purity of the gas had been kept to the required standard.

The CHAIRMAN: Gentlemen, after the extraordinary state of excitement and the prolonged scare which the gas world has experienced, I feel that I should be wanting in my duty if I did not avail myself of this opportunity of offering you—not without much diffidence—my views on the present aspect of this large and important subject. I venture to believe that the scare is at length subsiding, but not without having helped to justify what I have said on former occasions as to the reasonableness of a profit of 10 per cent.; for it has certainly shown that gas property is, in a special degree, liable to be made the prey of speculative operators in the Money Market, who, taking advantage of an interesting phase of scientific experiment and development, and aided by all the well-known arts of the Press, have driven many timid people to part with their shares at a much lower price than that at which they bought them. But, on the other hand, I am inclined to believe it will have proved in no small degree beneficial, by having roused the gas companies to greater efforts—to a sense, indeed, of the absolute necessity of more completely removing the imperfections of gas. Moreover, incidentally, it has, I believe, at length, called the attention of the public to what gas is really capable of, not only in lighting and heating, but also in a most unexpected direction—for a purpose in which it has actually, to some extent, superseded steam. The difficulty for the public in general has been to discriminate between the statements of those who have made it their business to induce a belief that gas was about to be superseded by electricity, and the statements of those whose inquiries have simply had truth for their object. None are more deeply interested in these inquiries than the gas companies. For if some of the statements which have been made were even approximately true, the prospect for gas shareholders would be anything but encouraging. We have all read so much on the subject, that I feel I should be needlessly trespassing on your time if I were to enter at any length on the nature and properties of the electric light in general, or the various apparatus that are being employed in its production. You are all aware that electricity itself is one of the most interesting and important of sciences. And it is some consolation to believe that this attempt to prove that it will supersede gas, has given an impulse to its further development. Every real addition to electrical science is sure to bear good fruit, and, as an illuminating agent, it is certain to be employed where the conditions and requirements are such as to make it eligible and safe. What I am concerned to show, or to attempt to show, is that it is a mistake to suppose, and a misrepresentation to assert that the electric light is at all fitted to compete with gas—either for public or private lighting—on the grounds of economy, adaptability to general local requirements, illuminating power, or freedom from annoying, offensive, or injurious effects. First, as to economy. In this respect my task is easy. For all the most reliable reports—those made by the most competent authorities, after the most careful and elaborate inquiry and investigation—concur in the decision that electric lighting cannot compete with gas in point of economy. I will refer only to one of those authorities—but that one is necessarily, from his position, and from the very fact of his appointment, above suspicion. The Corporation of Liverpool, disposed to give a fair trial to the electric light—probably in answer to the very general popular excitement on the subject—commissioned their own Engineer, Mr. G. F. Deacon, M.I.C.E., to go to Paris and investigate the merits and eligibility of the electric light, with a view to public lighting at Liverpool. Mr. Deacon, in the course of a most elaborate report, expresses the opinion that the cost of the only system of public lighting by electricity at present in use, is six times the cost of Liverpool gas producing the same degree of illumination, and twenty-one times the cost of Liverpool gas which would, under ordinary circumstances, be consumed in the illumination of the same area. Now, making every reasonable allowance, as Mr. Deacon, in his report, proceeds to do, for the various actual and possible modifications of this comparison, arising from improvements and variety of machinery and apparatus, here surely is margin enough to warrant the conclusion that no Municipality will venture to propose to its ratepayers the substitution of electricity for gas, on the ground of economy. Well, next, on the ground of adaptability to general local requirements, the providing of more or less light at the moment it is wanted, exactly where it is wanted, and just so long as it is wanted—be it only for a few minutes at a time, and at any intervals, long or short—on this ground, I say, it is almost needless to dwell. I will just, however, for a moment, illustrate what I mean out of my own domestic experience. Occasionally, in my small domicile, I have to go down into my own cellar, which is used for other purposes besides storeage of wine, beer, and coals, and so has often to be visited. My servant precedes me. He opens a door, and the steps are dimly discernible. He advances, and touches the tap of a tiny gas-jet kept always burning, but so small as to be almost imperceptible. In a moment the passage is sufficiently illuminated. He proceeds, and by a similar operation at one or two other jets suitably placed, the whole of the space, which is somewhat intricate, is lit up as if by magic. On returning, the taps are again touched and the jets subside to their previous condition, and so remain hour after hour with a consumption of gas that is almost inappreciable, yet ever ready, at a touch, to spring up into brilliantly effective illuminants. But if this is so striking in my very limited domestic premises, what must it be in many of your warehouses and subterranean stores, where the piled-up goods form long lanes and passages with every intricacy of nook and turn. The fact is, we are all so familiar with this rich abundance of accommodation that we think not of it. Let those who have read all that can be said for the electric light consider whether they have yet met with any information which would induce them to try its substitution for gas in the infinite variety of uses with which we have all become so familiar. And now with regard to illuminating power. It is much too flippantly assumed that in this respect the palm must, without question, be conceded to the electric light. The Liverpool Engineer makes it clear enough that, in a case most favourable to the electric light—the light being a concentrated regulator of 6000-candle power in the centre of a circular carriage-way—the whole circular area can be better illuminated with gas than the carriage-way is illuminated by the electric light, although the aggregate power of the gas lights employed shall be that of only 2000 candles, whereas that of the electric light is 6000 candles. Moreover, thanks to the spirited conduct of the Phœnix Gas Company, no other report is really needed on this head than that given in *The Times*, on Monday, the 13th Jan., of the lighting by gas of 500 yards of the Waterloo Bridge Road, which was done gratuitously by the Phœnix Company, at the suggestion of their Engineer, Mr. C. Woodall, and with the permission of the Local Authorities, in order, I presume, to show that the inefficiency of the lighting of London streets is attributable, simply and solely, to the parsimony of the Parochial Authorities, and not to any shortcoming in the illuminating power of gas. The beautiful lamps and burners supplied by Mr. Sugg on the occasion, and the properly increased number and arrangement of the same, produced conviction in the minds of many who previously had no correct ideas on the subject, but who had hitherto ascribed the dismal dinginess of thoroughfares unenlivened by shops, to the powerlessness of gas to effect the object for which it is supplied. And, further, I am inclined to believe that Mr. Sugg himself is prepared to exhibit gas in tall standards in single-handed rivalry and competition with the most approved form of electric lamp that has yet been produced. And, lastly, Mr. James Livesey's application of the vapour of naphthaline to the common gas jet intensifies its intrinsic power of illumination threefold. In short, were gas employed with anything approaching the lavish profusion with which the electric light is being so recklessly puffed and advertised, gas would have nothing whatever to fear in the comparison, on the score of illuminating power. I come now to the consideration of the claims of the two modes of lighting in regard to freedom from annoying, offensive, and injurious effects. Gas is often charged with over-heating and with vitiating the atmosphere whenever it is employed in houses or buildings of any kind; whereas by the electric light, it is said, very little heat is produced, and, even in the opinion of the Liverpool Engineer, the vitiation of the air is scarcely appreciable. I will first dispose of the alleged annoyance from heat. In itself, the giving off heat must be allowed to be an advantage. The annoyance can only be said to arise from excess of heat. The heating power of a source of heat depends on two things—the quality or intensity of the heat itself, in its nature or essence, and the area of the heat-yielding surface. The heat even of the sun, if limited to that radiated from a point in its surface, would be inappreciable at the distance of the earth. It is the aggregate radiation from all the points of its vast disc which produces the effect actually experienced. But I apprehend it is not the discomfort of immediately radiated heat—personal roasting by direct rays—that is complained of. No one is so silly as to subject himself to that sort of inconvenience by proximity either to lamp or fire. It is, of course, the heated air that is complained of. Air is warmed by convection. The air in immediate contiguity with a heating surface becomes warm, expands, rises, and is replaced by other and colder air. The process is continually being repeated, and, if the quantity of heating surface is disproportioned to the size of the room, the whole of the air may become unpleasantly overheated. This is a matter, however, which surely is perfectly controllable, the total amount of heating surface being the sum of the surfaces of all the gas-flames employed. And, I repeat, the property of heating or warming is itself an advantage—an enormous advantage. If gas possesses it and electricity does not, so much the worse for electricity. A very large room may be lit with gas, in the utmost profusion of brilliancy, in such a manner that, besides diffusing a genial warmth, this very quality of heat-yielding shall at once effect a perfect and most agreeable ventilation, and free the air of the room not only of every trace of the products of combustion, but also of all the impurities due to a crowded assembly. In a small room it is only necessary to exercise common sense in limiting the amount of gas employed. In cold weather it aids in economizing fire, and in hot weather it secures a constant

change of the air in the apartment. Well, so much for the alleged annoyance from heat in the use of gas. But now I am going to take the bull by the horns. I am going to question the right of electricity to the claim to superiority very generally allowed on the ground of greater freedom from offensive and injurious impurities. My arguments may be open to objection, and may be refuted. To me they appear to be valid, and to deserve very serious consideration. The heating surface of gas-flames giving the same amount of light as a permanent electric spark consuming carbon—for such, I presume, is the voltaic arc of an electric lamp—is very much greater than that of the heating surface in the electric lamp. And to this, I apprehend, must be ascribed the greater heating power of the gas-flames on the air of a room. The hydrocarbons constituting the gas, on reaching the burner, are decomposed. The hydrogen of these compounds, as well as the hydrogen constituent of the gas, combines with the oxygen of the air into aqueous vapour, and the bright surface of the gas-flame is an aggregate of incandescent particles of carbon. These also are seized upon by the oxygen of the surrounding air, and combine with it into carbonic acid gas. The particles of carbon thus used up are constantly replaced by others, and so the process of combustion goes on; and, as in all other cases, whether of coal or wood in the grate, or candle or lamp on the table, or the electric spark consuming carbon points, carbonic acid is one inevitable product—heat, in fact, being the invariable effect or manifestation of chemical combination. This, then, is the source of heat in the gas-flame. The heat-yielding surface, as I have already pointed out, is much greater than in the electric lamp, but whatever the electric spark may be in its essence, or whatever may be the cause of the enormous difference of intensity in heat from difference sources, there is no doubt that the intensity of that of the electric spark is exceedingly great—infinitely greater, indeed, than that of a gas-flame, or of any other source of heat at man's disposal. We know that the instantaneous action of a flash of lightning is capable of melting metal—those, at any rate, of low specific heat, such as gold. In the case of a man struck by lightning, his watch has been discovered fused—fused in an instant. Moreover, we know that the electric spark—in some cases a succession of electric sparks—is able to effect the chemical combination of elements that resist direct combination by almost all other known agencies. Now let us consider the actual circumstances. We have a speck of light so dazzling that the naked eye cannot look at it. Well, it must be veiled, and that implies, of course, a sacrifice of illuminating power. But it is also a speck of heat—of heat so intense that it has no rival. And this speck of intense heat is in permanent contiguity with minute portions of substances, elementary and compound, which, in a state of simple mixture and due proportion, constitute the air we breathe. These substances are mainly the two elementary gases, oxygen and nitrogen, and, in smaller proportion, carbonic acid and the vapour of water. Thus it may be said there are submitted to the continued action of this most intense heat-speck, particles of oxygen, nitrogen, hydrogen, and carbon—hydrogen in the compound aqueous vapour, and carbon in the compound dioxide—and aqueous vapour is capable of holding in solution a variety of possible compounds of these elements. In the ordinary state of the atmosphere these substances are simply in salutary innocuous mixture. The nitrogen subsists in company with, but in freedom from the attacks of the all but universal assailant, oxygen. And yet, with hydrogen, also within reach, it is capable of being combined, in the embrace of the destroyer, into one of the most powerful acids—nitric acid—and other compounds. Carbon, again, with nitrogen and hydrogen, may combine into various compound substances, and among them into the cyanide of hydrogen, or prussic acid—an extremely volatile and most deadly poison. It is for the practical chemist to say to what extent so powerful an agent as the electric spark may or may not effect these or other chemical combinations. We know some things of this kind which it can effect in less than the 24,000th part of a second, and here we have its action continuous. We know, too, that there is such a thing as atmospheric nitric acid, and according to recent experiments by a member of the Chemical Society of London, nitric acid is actually produced by the electric light. What other deleterious effects may manifest themselves, in case of the domestication of electric lighting, remains to be investigated. The suckling tiger or the lion's whelp may be fondled with interest and safety for a while; but never yet, except in the annals of fable, have these creatures full-grown been allured to domestic familiarity. And so this "fire from heaven" may yield both interest and amusement while limited to the toys of the laboratory, and yet when the attempt is made to use it in emulation of Apollo's darts, it may be found that, together with an incomparable effulgence, it is fraught perchance with pestilence and death. But let us be fair. Let us turn now, for a moment, to the offences of our gas. A ton of coal—2240 lbs.—on an average, contains about 25 lbs. of sulphur—chiefly in combination with iron. The coal is distilled in clay or iron retorts, and the crude gas which issues from the retorts carries with it, in some form or other, nearly half the sulphur. The largest portion of this is in the form of sulphuretted hydrogen, and this very offensive sulphur compound is in all cases completely removed by the processes of purification already well understood and employed. The amount of the other sulphur compounds which may exist in the gas—never great—has, by various means, chiefly by the use of lime, been already considerably reduced; but its complete removal, it must be confessed, has not hitherto been generally accomplished. It is alleged—and I know of no reason to doubt the truth of the charge—that when these compounds reach the burners, the result is, or may be, the production of small quantities of one or other of the sulphur acids. These may be held in solution in, or in combination with watery vapour—for they have strong chemical affinity for water—and so they get deposited on articles of furniture, or may prove in some degree injurious to health. It must be admitted that hitherto this reproach has been more or less justified; but it does not follow that it will necessarily continue to be so. The scare has already worked well, and it will do more. It has given an impulse to gas science, which will not, which must not stop short of a complete mastery of the sulphur trouble. No good chemist will allow that there is in this problem any insuperable difficulty. The public service demands pure gas. It is the duty, as well as the interest, of the gas companies to invite the aid of the most accomplished practical chemist, and to offer the most ample remuneration for every effective step in the right direction, And I do not hesitate to say that the desirable end must, and will be attained, and that without much further delay. Meanwhile, I beg to call particular attention to one feature in the comparison of the two modes of illumination we are considering. Whatever may be the special offensive or noxious impurities of gas—other than carbonic acid, which I do not regard as such—they arise from one or other of the components of the coal from which the gas is distilled, and such component, being a definite and ascertainable and limited substance, whose absence, and not presence, is necessary, it may certainly be separated and excluded by some means or other. Of this there can be no doubt. But if there be any noxious or injurious substances brought into active existence by the electric light, they arise from chemical combinations of the elements of the air itself, produced by the action of the light itself, which elements are absolutely certain to be present and beyond human control. That is my position. Coal gas is purifiable. The evils of the electric light, if evils there be, are absolutely inseparable from its use—it is their certain cause—they are its uncontrollable effects. There is just one other very interesting subject on which I will touch. All evils are not unmitigated evils. You are aware that one of the perils of the domestic use of coal gas is its liability to form an explosive mixture with air. The explosive ingredients are, in fact, marsh gas—which is the largest constituent of coal gas, with the exception of hydrogen, and known in the coal mines as fire-damp—and oxygen, which forms a little more than one-fifth part of the volume of the atmosphere One part of coal gas to ten parts of air will yield this explosive mixture, which is unfortunately of a sadly dangerous character. This very property, however, has been turned to account in a most useful and profitable invention. In many departments of trade and manufacture, it has hitherto been found necessary to employ a steam-engine of a small or moderate power. Such an engine must be more or less of a nuisance. It can now be dispensed with, and the same amount of power obtained by the newly-invented gas-engine. In this the piston of the cylinder, instead of being driven by steam, is moved by successive explosions of a mixture of gas and air, fired by a small gas-jet. Instead, therefore, of having to get up the steam, by heating the boiler with much expense of fuel and labour, and much annoyance of noise and smoke, it is only necessary to turn on the gas. When we thus see addition after addition made to the already numerous uses of gas, when we consider its cleanliness, its versatileness, if I may use the expression, its infinite applicability to purposes of heating and lighting, proportioned in all cases exactly to the degree of requirement, the facility of its manipulation, and the amount of ingenuity and skill bestowed upon the improvement of all the apparatus employed in its use and manufacture, it is difficult to understand how any sensible man can have been deluded by the speculative dreamers who have proclaimed that it was about to be superseded by electricity. Gentlemen, I congratulate you on the possession of a truly valuable property—a property that I believe to be as safe as any property can be in these times. You have an excellent and devoted Manager, who deserves your most liberal consideration. Your Act of Parliament requires that the illuminating power of your gas shall not be less than 14 candles. I am proud, and I am sure my colleagues are proud, to have to tell you that, under the vigilant personal superintendence of Mr. Weeks, it very generally reaches to 16 candles, and even more. This excess of illuminating power is quite equal to 3d. per 1000 cubic feet in the price of gas. And when it is added that the Directors have seen their way not only to maintaining this degree of illuminating power, but also to a reduction of 3d. per 1000 feet in the price from Christmas, I trust that the condition of your business will be considered fairly satisfactory, not only by the Shareholders, but by our customers and the public in general. And now, gentlemen, thanking you for the patience with which you heard me, I will conclude by moving—"That the reports of the Directors and Manager, as printed and circulated, be received and entered on the minutes."

The Master of Christ's College, in seconding the motion, thanked the Chairman very heartily for his most interesting address, and remarked that he (the Chairman) had given him information and instruction which he certainly did not possess before. He was very glad he had heard the address, and thought the result of the experiment that the Metropolitan Board of Works were making, as to the effect of the electric light on the Thames Embankment, would only tend to confirm Mr. Deacon's experiment at Liverpool. There was no doubt that the Paris Exhibition had a great deal to do with the feeling that had been produced, as he had been told on all hands, by persons who knew nothing about science, that the effect of the light was quite marvellous. But the expense of it had not been made known. That was another question. No doubt, the effect of the light was very wonderful, and on great public buildings it might be most valuable; but from what they heard from the Chairman, it seemed, as regards general illumination, that nothing had been done to show that gas could be dispensed with.

The motion was then agreed to.

Mr. G. W. Fitch proposed that the Chairman's speech should be printed and circulated among the Shareholders. He said it was so valuable that it ought not to be lost sight of by the Shareholders and the public generally.

Mr. T. Allen seconded the motion, which was adopted.

The Chairman said that the state of the Company's finances would justify the motion he was about to propose, viz.—"That a dividend for the half year, of 10 per cent. per annum on the consolidated stock, and 7 per cent. on the new shares, be paid on the 1st of February, free of income-tax."

Alderman Peed, in seconding the motion, thanked the Chairman for the valuable address he had given, and said it was his opinion that this scare about the electric light, like many others, was ridiculous and absurd, and he urged the Shareholders to hold fast to their investments in the Company. It was his opinion that gas could never be superseded, and he spoke of the great value of gas-stoves in the summer-time, by which little dishes could be cooked without the use of a large kitchen fire. Their Chairman had always been most assiduous in showing the value of gas, and he trusted that the Shareholders would not discard it by selling their shares.

The Master of Christ's College proposed a vote of thanks to the Chairman for presiding, and to the Directors for the successful manner in which they had managed the affairs of the Company. The quality of the gas had, he said, greatly improved lately, and he hoped attention would be given to the utilization of gas for general purposes. He thought scarcely enough attention had hitherto been given to this matter. He agreed with the proposition made by Mr. Fitch, and thought that if the Chairman's address were printed and circulated among most of the principal people in the town, it would be an advantage to the Company.

Mr. T. Allen seconded the motion, which was carried unanimously.

The Chairman, in returning thanks, said he should always do his best for the interests of the Company.

The meeting then separated.

PARA GAS COMPANY, LIMITED.

The Ordinary General Meeting of Shareholders was held at the Offices of the Company, 7, Union Court, Old Broad Street, on Thursday, the 30th ult.—James Brickwell, Esq., in the chair.

The Secretary (Mr. T. S. Borradaile) read the notice of meeting, and the following report and statements of account were presented:—

The Directors are happy to have it in their power again to meet the Shareholders with a favourable report on the condition and prospects of the Company.

In comparing the results of this half year's working with the corresponding half of the previous year, a slight increase will be noticed to the advantage of the Company in the revenue account—viz., this half year the ascertained profits have been £3667 19s. 4d., as against £3351 6s. 4d. for the former period alluded to, thus showing a better result to the extent of £136 13s. It is satisfactory to note that this has been partly caused by a fair and steady increase in revenue derivable from private lighting—a most important item. There has, however, been a falling off in the profits on coke sales, there being still great difficulties in realizing this valuable product. Exchange also shows a considerable decrease on the credit side of the account. On the other hand, the working expenses have been reduced by nearly £250.

The Directors had hoped that the result of the year would have worked out better,

but the great difficulty of disposing of the coke at remunerative prices has disappointed them. On this subject the Manager, Mr. Louis Penny, writes: "The sugar refiners up till now have been the principal consumers, but so much less sugar is now refined in the province, that the fact of the sales keeping about the same shows that the private houses are gradually getting into the way of using it." To encourage this private consumption, the Directors have from time to time sent out cooking-stoves suitable for the use of coke, to be sold to the public at reasonable rates.

In comparing the profit and loss account for the two periods now under review, it will be observed that the amount written off for bad debts is somewhat larger, while an ascertained loss on unserviceable meters has been provided for, thus further reducing the amount available for division by £300 2s. 4d.

With the balance brought forward from the previous half year (after payment of the July dividend), £1610 12s. 8d., the available amount for division (bad and doubtful debts being provided for) is £4853 5s. 8d., and from this the Directors now recommend a dividend at the rate of 5 per cent. per annum for the half year just closed, payable on and after the 18th of February, 1879. This, together with the interim dividend paid in July last (in accordance with the powers vested in the Directors) at the rate of 4 per cent. per annum, will make a total dividend of 4½ per cent. for the twelve months ending Sept. 30, 1878.

The Directors have to report to you the termination of the agreement with their Manager and Engineer, Mr. Louis Penny, whose services, during the three years he has held the appointment, have been of the greatest value.

It is with extreme regret that the Directors have to announce to you the death of their late colleague, Mr. George Whitfield, whose untiring exertions in the interests of the Company will be much missed.

In pursuance of the powers vested in them by the Articles of Association, the Directors have elected Mr. Louis Penny, the late Manager and Engineer, to the vacant seat at the Board.

Mr. George Harlowe Sumner, who has been for twelve years in the service of the Company in Pará (lately as Assistant Engineer) has been appointed to take the place of the Engineer and Manager now retiring.

The works of the Company continue to be maintained in every respect in an efficient way, and the letters and reports of the Manager are satisfactory.

Two of your Directors, Mr. Edward Tiley Lambert and Captain J. Walrond Clarke, retire by rotation, but are eligible for re-election, and offer themselves accordingly.

Mr. Philip Crellin, the Auditor of the Company, likewise retires from office, but, being eligible, also offers himself for re-election.

General Balance-Sheet, Sept. 30, 1878.

Dr.				Cr.			
Authorized capital		£175,000	0 0	Works, including extensions, furniture, &c.	£142,952	16 1	
Less not taken up		8,130	0 0	Gas-fitting capital on March 31, 1878	11,247	3 5	
		£166,870	0 0	Extensions to date	87	8 3	
Debenture loan		4,000	0 0	Value of stock in Pará	3,247	19 3	
Fire insurance-fund		957	16 11	Lighter capital	1,732	14 11	
Bills payable		225	9 7	Stores	1,399	6 2	
Sundry creditors in London		671	6 9	Coals	3,716	18 11	
Ditto in Pará		387	8 1	Wood	1	8 8	
Gas-fitting rental reserve-fund to March 31, 1878. £737 11 0				Maué and Co. (in suspense)	112	14 9	
Add reserve for the current half year, less expended in repairs	18 11 4			Sundry debtors in Pará	7,041	9 9	
		756	2 4	Cash at Pará bankers	1,808	16 7	
Profit and loss		4,853	5 8	Ditto Glyn and Co.	1,846	14 11	
				Petty cash (London)	5	15 8	
				Bills of exchange, in hand	3,520	2 0	
		£178,721	9 4		£178,721	9 4	

Revenue Account, for the Half Year ending Sept. 30, 1878.

Coals & wood for carbonizing		£3,199	4 3	Public lamps, &c.		£5,756	6 5
Wages, includ. lamplighting, purification, & carbonizing		2,079	10 5	Private lights		3,408	16 9
Salaries		880	12 8	Public establishments		271	7 3
Sundry charges		61	11 1	Illuminations		49	7 5
Retorts		105	13 1	Fittings-rental		127	8 2
Repairs		428	0 4	Meter-rental		205	7 2
Office expenses, stationery, printing, &c.		124	19 10	Lighter revenue		246	17 5
Law charges		29	8 10	Coke		1,062	5 11
Gas-fitting revenue and expenditure		286	4 0	Tar		94	3 1
Interest and discount		26	14 4	Exchange		45	10 11
Debenture interest		100	0 0	Transfer fees		4	15 9
Directors fees		300	0 0	Rent and taxes		47	19 11
Travelling expenses		30	7 3				
Profit and loss		3,667	19 4				
		£11,320	5 5			£11,320	5 5

Profit and Loss Account.

Dividend paid July, 1878		£3,337	8 0	Balance brought forward from March 31		£4,948	0 8
Bad debts to this date	£130 6 3			Revenue account (profit)		3,667	19 4
Less recovered during the half year	5 2 3						
		125	4 0				
Amount written off for unserviceable meters		300	2 4				
Balance carried forward		4,853	5 8				
		£8,616	0 0			£8,616	0 0

The CHAIRMAN, in moving the adoption of the report, said: Gentlemen, I will just make a few remarks, and they will only be very few, because the report has dealt extensively with the operations of the Company during the past year. It was not my intention to refer to a matter which has been so very prominent before all those who are interested in gas—I mean the electric light. Probably many of you may have seen a further confirmation of the result of the introduction of the electric light as an opponent to gas lighting; and it must be satisfactory to witness what has been done lately at a place called Westgate-on-Sea, the owner of which is a Mr. E. F. Davis, who, also, I think, is the sole proprietor of the gas-works supplying that district. He was desirous of obtaining some definite notion as to the value of the electric light, being, as the proprietor of gas-works, well acquainted with the cost and conditions of gas supply, and he therefore employed two gentlemen, who have been experimenting with the electric light on this new estate of his, and whose report appeared in a recent number of the JOURNAL OF GAS LIGHTING. I read in *The Times* this morning a notice of these lighting experiments at Westgate, and I will just refer to the results obtained, which I think must be very gratifying. It appears that the report made by these gentlemen, whose veracity certainly cannot be called into question, was on the light obtained by means of the Jablochkoff system, which was considered by them to be one of the most suitable for Mr. Davis's purpose. The expense of maintaining that light—the cost of fuel, oil, and the Jablochkoff candles—amounted to just as much as a similar quantity of light supplied in London by one of the Gas Companies there. Of course, we must make considerable allowance for the price charged at Westgate, which is, I think, 7s. 6d., against the London price of 3s. 6d. It is very remarkable that, in working out the relative expenses, even at Westgate, they very closely correspond with the calculations made in London; and therefore the results arrived at must be a source of still greater satisfaction. Nothing could be more convincing of the value of gas over the new mode of lighting than the article I allude to, and I trust that those who have not read it will devote a few minutes to its careful perusal, because if their minds have not been set at rest by the accounts hitherto given of the working of the electric light, that article will be quite sufficient to do so. In reference to our own Company, I am glad to say the electric light has not been any impediment up to the present time, and I trust it will not be so in the future. I think we must consider that, on the whole, our working for the past year has been tolerably satisfactory. Not that we have not had our drawbacks, like every other Gas Company, more particularly with regard to the article which we were accustomed to look forward to as bringing us a large addition to our revenue from products—namely, coke. Unfortunately, even at Pará, there has been the greatest difficulty in realizing our coke. As explained in our report, the sugar refining trade has decreased; but the consumption in other ways has, to a certain extent, increased. Still, it is with very great difficulty that the yard can be kept clear, and it is found that no diminution in price would extend the use of this article for domestic or other purposes. But we must not be surprised at that, because the same state of things has existed with almost every gas company. It appears that another reason for the falling off in the receipts for coke has been, that some of the steamers from Liverpool have occasionally taken out supplies, probably to fill up on owner's account; but our Manager has been provided with fresh means for the sale of this important product. At his request, we have forwarded to him, on two occasions, a number of stoves, specially constructed for the consumption of coke; but although that has had some good effect, still the results have not been so favourable as we could have wished. As regards our carbonizing account, I think we can say that the conduct of that department has been very satisfactory; this will appear from both the accounts and the report. I find that for every ton of material carbonized, our Manager has produced, with the consumption of the usual quantity of wood, 10,660 cubic feet of gas. Now, all those conversant with gas-making must consider that a very good return per ton of coal; and what is still more satisfactory is, that out of that quantity we have sold 9460 feet, which, considering the way in which gas is made and sold at Pará, is something on which we may congratulate ourselves. We have, fortunately, still had the advantage of coal remaining at the usual price, and for the last year or so we have been enabled to send it out at that lower price. This, up to the present time, has been productive of very favourable results, and I am happy to say we have to-day entered into contracts for a twelvemonth's supply, at 3d. per ton less than we paid last year. We must therefore consider that the results will be equally satisfactory on that point when we have the pleasure of meeting you again. The gradual increase in the supply to private consumers within the last three years must be highly gratifying, more particularly so when regarded from a money point of view. I find, in taking the last three years, in the year 1876—which, I think, was soon after the present Board came into existence—we paid, in the first half year, a dividend at the rate of 2 per cent. per annum, and in the second half, 4 per cent., making 3 per cent. for the year. Taking the next year, we paid 3 and 5 per cent.; and last year we paid 4 per cent. and 5 per cent. There has, therefore, been a gradual increase of one per cent. for the last three years. I only trust that, with our present condition of working, we may be able to continue this satisfactory increase. We have always had great confidence in our worthy Manager, Mr. Louis Penny, and the results of the past year's working show that it has not been misplaced. Mr. Penny's three years engagement has expired; but I believe there has been something beyond the expiration of his term of service that has induced him to return to England. Unfortunately, he had not been at Pará very long before he had a severe attack of the fever that has always been so prevalent there; and even within the last few months he has, I am sorry to say, had a second attack. He is, therefore, strongly convinced that the climate is one in which he ought not to continue to reside. The consequence is that he gave us notice of his desire to return to England, and we immediately took steps to secure a successor. You will see by the report that we have already done so, by appointing a gentleman who has, for some time past, been Mr. Penny's assistant, and has been with the Company for, I think, something like twelve years. This gentleman has our confidence, and certainly that of Mr. Penny, who has expressed himself very strongly in favour of the selection we have made, believing it was the wisest course we could adopt, to take a gentleman already possessing sufficient technical knowledge to conduct our works in a satisfactory manner. We have, therefore, appointed Mr. Sumner to occupy the position held by our late Manager. With reference to Mr. Penny, I cannot speak of him too highly. I am sure a great part of our success has been attributable to his superior management. He displayed not only great ability as regards the mechanical portion of the works, but also considerable skill as a diplomatist. He consequently overcame many of the difficulties experienced by former managers. One of these difficulties was the collection of the rates, and perhaps the greatest was to keep the Government tolerably close up in their payments. The fact is, their arrears were at times very great indeed; and it is very satisfactory to be able to report to you to-day, that in the last advice we received from him, only a week ago, he sent us a very valuable enclosure, at the same time stating that the Government had now paid up to within one month of the time at which he despatched his letter. Now, that is certainly a matter for congratulation, because we have suffered rather severely from the very large amount of arrears that previously existed. There is another matter connected with the working of our affairs that may be considered satisfactory. We have, I believe, always been liable to a sort of taxation called "*Expediente*," which is not only a tax upon coal, but upon all other kinds of goods. However, from the exertions made by our Manager, and other gentlemen connected with the shipping business, who, by their representatives, said they considered it a great hardship, I believe that, if it is not already abolished, there is a considerable prospect of its being so. At present there is no charge for "*Expediente*," so that there will be an advantage of something like between £300 and £400 a year to the Company. This is certainly no mean item, considering the quantity of gas we supply. Perhaps it would not be inopportune here to say how grieved the Board are at the loss of one of their brotner Directors, Mr. Whitfield. We cannot speak too highly of his memory, in consequence of the great service he rendered to the Company. He was a thorough man of business, and, until his last severe illness overtook him, was most regular in his attention to the Company's affairs, particularly in reference to finance matters. I cannot but feel that our loss is a very great one; and this brings me to say that the Board, after due consideration, have employed the powers vested in them, and filled up the vacancy by the election of another Director, in the person of our late Manager, Mr. Louis Penny, believing that, at the present time, nothing could be more to the advantage of the Company than having that gentleman occupying the vacant seat at the Board. He will be of great service, not only at the present time, but in the future; because he possesses detailed information, without which it is very difficult to carry on correspondence in reference to gas business with the accuracy we might wish. We must therefore look forward to Mr. Penny's appointment as being of very considerable advantage to the Company. We have not been precipitate in action in this matter; and we trust that, whether it will be for a shorter or a longer period, we have done the wisest thing we could do under the circumstances. I beg to move—"That the report of the Directors and the

accounts, as presented to the Shareholders at this meeting, be and are hereby approved and adopted."

Mr. HENRY seconded the motion.

After some conversation as to the desirability of instituting a reserve-fund, the motion was put and carried unanimously.

The CHAIRMAN then proposed—"That the interim dividend paid to the Shareholders, at the rate of 4 per cent. per annum, for the half year ending the 31st of March last, be and is hereby confirmed; and that a half year's dividend, up to the 30th of September last, at the rate of 5 per cent. per annum, for the half year just closed, free of income-tax, be payable to the Shareholders on and after the 18th of February next."

Captain CLARKE seconded the motion, which was carried.

The retiring Directors, Mr. Edward Tiley Lambert and Captain J. Walrond Clarke, were re-elected, and Mr. Philip Crellin was re-appointed Auditor.

Mr. HENRY proposed a vote of thanks to the Directors, and in doing so referred to the improved position of the Company, expressing a hope that such a prosperous state of affairs would continue.

Mr. SODEN seconded the motion, which was cordially adopted.

On the motion of Mr. SODEN, seconded by Mr. OGG, a vote of thanks was accorded to the Engineer and Manager and to the Secretary, for their services during the past year.

The CHAIRMAN and SECRETARY having briefly returned thanks for the compliment, the proceedings terminated.

CAMBRIDGE UNIVERSITY AND TOWN WATER-WORKS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held last Friday—Mr. ELLIOT SMITH in the chair.

The Directors in their report recommended that a dividend on the consolidated stock, and upon the first and second calls on the new shares, for the half year ending Jan. 6, 1879, at the rate of 10 per cent. per annum, be paid on the 1st of March next, free of income-tax. After paying this dividend, there would be a balance of £166 1s. 9d. to be carried forward to the next account. The retiring Directors were Messrs. Dennis Adams, Charles Balls, and Edmond Foster, who were eligible for re-election. The expenditure on the capital account up to Jan. 6, 1879, was £68,512 7s. 8d. The revenue account showed the income for six months to be £4286 19s., with a net profit of £2887 3s. 3d., exclusive of the Cherryhinton Estate rent account.

The Engineer and Manager (Mr. H. Tomlison) reported that, during the past half year, water from the Company's works had been laid on to 223 premises, the increased rental derivable from which was £226 per annum. The total number of premises now supplied was 7250. The use of the new engine and boiler at the Company's pumping-station continued to effect economy in the consumption of fuel. The general condition of the Company's works was satisfactory.

The CHAIRMAN moved that the reports of the Directors and the Engineer and Manager be received and entered on the minutes.

Alderman DEATH seconded the motion, which was agreed to.

The CHAIRMAN proposed a dividend of 10 per cent., in accordance with the recommendation of the Directors.

This was seconded by Mr. CLAYTON, and adopted.

Messrs. D. Adams, C. Balls, and E. Foster, were unanimously re-elected Directors of the Company.

Alderman DECK proposed a vote of thanks to the Chairman for presiding, and to the Directors for the very excellent manner in which they had conducted the business of the Company.

The motion was seconded by Mr. EMSON, and carried *nem. con.*

The compliments having been acknowledged by the CHAIRMAN and by the MASTER of ST. CATHARINE'S COLLEGE, the meeting terminated.

THE NEWCASTLE TOWN COUNCIL AND THE GAS COMPANY'S BILL.

At the Meeting of the Newcastle Town Council last Wednesday—the MAYOR (Mr. Robinson) in the chair—the following report from the Gas Committee was presented:—

The Gas Committee of the Council beg to report that they have examined the provisions of the Bill the Newcastle and Gateshead Gas Company intend to promote before the present session of Parliament, and your Committee recommend that the Gas Company be requested to make the following alterations in the clauses relating to price, quality, and other matters:—First, as to price. The Bill provides that an initial or standard price of 3s. 4d. per 1000 cubic feet should be charged. Seeing that the present price for gas is 2s. 9d. per 1000, at which price the Company are able to make a reasonable profit, your Committee recommend that the initial price should be 3s. per 1000 feet. Second, as to quality. The Bill provides that the prescribed number of candles shall be 15, when tested with Sugg's, No. 1 "London" Argand burner. Your Committee beg to point out that they are advised that this is a lowering of the standard of illuminating power, as compared with the provisions of the Act under which the Company are at present working, and that the same gas which gives 14 candles illuminating power when tested by the present standard burner, will give from 15½ to 16 candles if tested by the proposed new burner. Your Committee, therefore, recommend that the prescribed number of candles be 16 instead of 15. If this is not complied with, then your Committee recommend that the old clauses relating to the illuminating power and test burner should be continued in the present Bill. Your Committee further recommend that clause No. 51, in the Act of 1864, relating to the appointment of Examiner, necessity to give notice of intention to test the gas, and other points, be altered, so as to be more in conformity with the Gas-Works Clauses Act.

W. H. STEPHENSON, Chairman.

Town Hall, Newcastle, Jan. 23, 1879.

The Parliamentary Committee also reported as follows:—

Your Committee have had under their consideration a Bill proposed to be introduced into Parliament during next session by the Newcastle-upon-Tyne and Gateshead Gas Company, and beg leave to submit the following observations thereon:—

Prior to the passing of the Newcastle-upon-Tyne and Gateshead Gas Act, 1873, the capital of the Company was £300,000, upon which the maximum dividends which the Company were entitled to declare were limited as follows:—

On A stock, £160,000	10 per cent.
On B stock, £40,000	3½ "
On C stock, £100,000	7 "

The aggregate amount of such maximum dividends on the whole £300,000 being £24,400.

By the Act of 1873, without any actual addition by the Shareholders, the above-mentioned £300,000 of share capital was converted into a consolidated stock, of the nominal value of £350,000, and the Company were empowered to raise an additional capital of £100,000 by the issue of new consolidated stock to that amount.

These powers were accompanied by a stipulation embodied in section 14 of the Act, limiting the dividends to 7 per cent. per annum on the consolidated stock, so long as the maximum price of gas within the boroughs of Newcastle-upon-Tyne and Gateshead should not exceed 3s. 4d. per 1000 cubic feet, and 5 per cent. per annum, so long as such maximum price should exceed 3s. 4d. per 1000 cubic feet; and it was provided that the charges for the time being made by the Company for gas should be limited, so far as reasonably practicable, to the amount requisite to raise the dividends according to the scale aforesaid, without leaving an excess of undivided profits, and it was declared that the dividends of the Company should not exceed the rate before prescribed, unless a larger dividend should be at any time necessary to make up the deficiency of any previous dividend which should have fallen short of the yearly rate of 5 per cent. per annum.

Seven per cent. on £350,000 amounts to £24,500, and, therefore, 7 per cent. on the present consolidated stock is really 10 per cent. upon the £160,000 of the original A stock.

By the Bill which it is now proposed to introduce, the Company seek materially to vary the foregoing arrangement, to the disadvantage of the consumers; that is to say, it is proposed by section 12, that for every penny charged in excess or diminution of the price of 3s. 4d. per 1000 cubic feet in any half year, the rate of dividend shall, for such half year, be reduced or increased by 5s. in the £100 per annum.

The operation of this proposed alteration is shown by the following table:—

Prices charged per 1000 Cubic Feet.	Rate of Dividend at present allowed.	Rate of Dividend proposed to be made allowable.
1s. 0d.	7 per cent.	£14 0 0
1 3	7 "	13 5 0
1 6	7 "	12 10 0
1 9	7 "	11 15 0
2 0	7 "	11 0 0
2 3	7 "	10 5 0
2 6	7 "	9 10 0
2 9	7 "	8 15 0
3 0	7 "	8 0 0
3 2	7 "	7 10 0
3 4	7 "	7 0 0
3 5	5 "	6 15 0
3 6	5 "	6 10 0
3 7	5 "	6 5 0
3 8	5 "	6 0 0
3 9	5 "	5 15 0
3 10	5 "	5 10 0
3 11	5 "	5 5 0
4 0	5 "	5 0 0

Thus, instead of giving the consumer the full benefit of any diminution in the cost of manufacture, after securing the Company their present dividend of 7 per cent., they propose to take part of it to themselves so long as they do not charge more than 3s. 4d. per 1000 feet; and, instead of limiting themselves to a dividend of 5 per cent. when the price charged is above 3s. 4d. per 1000 feet, they propose to take much higher dividends, unless they charge as much as 4s. per 1000 feet.

At the present time the Company can earn their 7 per cent. dividend with a charge of 2s. 9d. per 1000 feet, and the consumer is entitled to a reduction in the charge, proportionate to any diminution of cost; but if the proposed Bill passes into law, the Company would not be debarred from dividing £7 10s. per cent., even while charging the consumer 3s. 2d. per 1000 feet; and should the cost of manufacture increase still more, they would be entitled to charge 3s. 5d. per 1000 feet, and still to divide £6 15s. per cent., instead of 5 per cent., as at present limited.

But this is not all that the Company seek to acquire to the disadvantage of the consumer, for by section 13 they seek power to establish a reserve-fund equal to 1-20th of their capital (say £22,500), out of profits over and above the prescribed limit, all of which, under present arrangements, belong to the consumer, to be enjoyed in the form of reduced charges.

It may be urged, with some degree of force, that, under the provisions of the Act of 1873, the Company have no inducement to exercise any economy beyond that requisite to ensure a 7 per cent. dividend, which they can earn even whilst charging much higher rates than are shown by experience to be necessary under fairly good management.

If this is considered a sufficient ground for an alteration of the existing arrangement in the consumers interest, your Committee would then suggest that the present price of 2s. 9d. should be taken as the standard price, and the present dividend of 7 per cent. as the standard dividend, with a variation of 5s. per cent. in the latter for every penny charged per 1000 feet above or below the standard price. This would operate as follows:—

Price per 1000 Feet.	Rate of Dividend.
2s. 0d.	£9 5 0
2 1	9 0 0
2 2	8 15 0
2 3	8 10 0
2 4	8 5 0
2 5	8 0 0
2 6	7 15 0
2 7	7 10 0
2 8	7 5 0
2 9	7 0 0
2 10	6 15 0
2 11	6 10 0
3 0	6 5 0
3 1	6 0 0
3 2	5 15 0
3 3	5 10 0
3 4	5 5 0

In support of this proposal, and as showing its reasonableness, it may be mentioned that the price of gas at Plymouth is 2s. 4d. per 1000 feet, and the price of coal there 18s. a ton; that the price of gas at York is 2s. 6d. per 1000 feet; and that, in London, the South Metropolitan Company sell 16-candle gas at 3s. per 1000 feet, and pay a dividend of 10 per cent.

By sections 23 to 26, the Company seek to acquire power to produce, manufacture, and supply light, heat, and motive power by means of any illuminating or heating agent.

In other words, the Company propose by these clauses to acquire power to produce and supply light, heat, and motive power, derived, as commonly understood, from electricity. The clauses under consideration do not in terms propose to give the Company a monopoly of the right to supply what, for brevity's sake, may be termed the electric light; but it is nevertheless true that, if this Bill should become law, great power would be thereby placed in the hands of the Company, to obstruct and hinder the acquisition of similar powers by the Corporation or any competing company. On the other hand, the promoters do not bind themselves to supply the electric light on any specified terms whatever; but, on the contrary, the Bill provides that the Company shall not be compelled to supply light produced by electricity or any illuminating agent other than coal gas, unless and until they shall have given public notice of their readiness to do so.

Whilst, therefore, it may be conceded that it would be for the public convenience that the right of supplying the electric light, so far as it involves the right of opening up the public streets, should be vested in the Gas Company, who already possess this power, it appears to be essential in the public interest to insist that this further power should be accompanied by one of two alternative stipulations—viz., either the Company should be bound to supply the electric light when required, on fair and reasonable terms clearly defined, or that the power sought to be acquired should, if granted, be guarded and qualified, so as not to give the promoters any right or power to obstruct or prejudice any application for similar powers that may at any time hereafter be made, either by the Corporation or any other persons.

In the present state of information as to the cost of the electric light, it appears to be impossible to frame any stipulations which would meet the former of these alternatives, and, therefore, your Committee recommend the latter as the course to be pursued in meeting the application for powers now under consideration.

By section 31 the Company propose to alter their liability with respect to the illuminating power and quality of gas supplied by them, and the mode of testing the same. Your Committee requested Mr. Pattinson, the Corporation Analyst, to report as to the practical effect of the proposed alterations, and his report is as follows:—

"*Newcastle-on-Tyne, Jan.* 25, 1879.

"Dear Sir,—In reply to your letter of the 23rd inst., drawing my attention to clause 31 of the Bill now being promoted in Parliament by the Gas Company, and asking for my views on the proposed alterations of the prescribed illuminating standard burner and purity sought therein, I have to say:

"1. That as the proposed new standard burner makes gas appear from 1½ to 2 candles higher in illuminating power than the same gas as tested by the present standard burner, the alteration of the prescribed number of candles from 14 to 15, asked for in the Bill, and the adoption of the proposed new burner, would be, in reality, a lowering of the standard of quality to the extent of from half to one candle.

"The proposed new burner is the one used in London and in many other towns, and it is therefore desirable, for the purpose of readily comparing the quality of the gas supplied with that supplied to other towns, that the same standard burner should be used in Newcastle. But if this is done, the prescribed number of candles should be 16, and not 15, as proposed in the Bill.

"2. I would suggest that the words, 'or other premises,' be inserted after the word 'works' in the second paragraph of clause 31. It may be more convenient, both to the Company and Gas Examiner, that the testing-places, should be away from the works; and there is no reason why the above-mentioned quality of gas should not be supplied to every part of the town.

"3. Instead of the third paragraph of clause 31, I beg to suggest that the following paragraph be substituted:—'The prescribed burner shall be Sugg's "London" Argand, No. 1, of the form and dimensions described in the notification of the present Metropolitan Gas Referees.' This defines the standard burner more exactly than the third paragraph of clause 31 in the Bill.

"4. As regards the test for sulphur, the Bill proposes to increase the limit of sulphur to be allowed in the gas from 17 grains to 20 grains; but as the proposed new mode of

testing will indicate about 10 per cent. more sulphur than the old mode, the real increase is very slight indeed, and as nearly all other towns where sulphur in the gas is tested have a limit of 20 grains, I would advise that the proposed alterations be agreed to. The mode of testing should, however, be more clearly defined, and I suggest that the words, 'the tests now in general use,' be struck out of the fourth paragraph, and the following words substituted—'the apparatus and method known as the Metropolitan Gas Referees sulphur test.'

"I beg to draw your attention to clause 51 of the Gas Companies Act of 1864, which is still in force, and to suggest that the conditions as to the appointment of a Gas Examiner, and the necessity of giving notice to the Gas Company before a test can be made, should be repealed, and a clause substituted more in conformity, as to these points, with clause 29 of the Gas-Works Clauses Act, 1871, but still retaining the power to test the gas at any reasonable hour of the day.—I am, dear Sir, yours truly,

(Signed) "JOHN PATTINSON."

"R. P. Philipson, Esq., Town Clerk."

In conclusion, your Committee recommend that a petition be prepared and sealed, against such of the clauses and provisions of the Bill as appear open to the objections pointed out or referred to in the foregoing observations.

THOS. WILSON, Chairman.

On the motion of Alderman WILSON, it was agreed that the two reports should be printed and circulated among the members. The Committee, he stated, would seek an interview with the Directors of the Company, and discuss the whole Bill with them.

A suggestion by Mr. STEPHENSON, that the Gas Committee should be incorporated with the Parliamentary Committee in any interview with the Directors, was also agreed to.

Mr. HAMOND, M.P., expressed the hope that one result of the communication with the Gas Company would be that they would give up any idea of increasing the sulphur maximum. It seemed rather singular that the Company, knowing that they could produce gas with under 10 grains of sulphur, should go to Parliament and apply that they might be allowed to increase the number of grains by 100 per cent. He trusted the Joint Committee would be firm on that point. The Committee should also see that the powers which the Corporation possessed under the Act of 1846, so far as regarded the lighting of the town by gas, could be applied to the lighting of the town by electricity. These powers, as they at present existed, provided that they could, in case of any default on the part of the Gas Company, take the lighting of the borough into their own hands. A clause might be put into the Company's Bill, giving the Corporation power, as they had under the Act of 1846 with reference to gas, to illuminate the borough with light other than that of coal gas. It was a very important matter that, while offering no unfair opposition to the Company, they should possess such powers.

Mr. GREEN asked Mr. Hamond whether he was not mistaken as to the clause. Did it not merely apply to the public lighting of the town, and not to the light to be supplied to the inhabitants?

Mr. HAMOND read the clause of the Act of 1846—"The Mayor, Aldermen, and Burgesses are empowered to light with gas the streets, lanes, and other public passages and places, and the houses, manufactories, and buildings within the said borough."

Mr. W. SMITH opposed any conference between the Joint Committee and the Directors until the next meeting of the Council, when the report would have been considered.

Alderman WILSON said all they asked was to have a conference with the Directors. They would report their proceedings to the Council, and then they would have to hold a special meeting, of which ten days notice must be given.

The motion was adopted.

Alderman WILSON next moved—"That a petition to both Houses of Parliament be sealed, in order to give the Corporation a *locus standi*, if necessary, to oppose the Bill." He said that he did not suppose it would be necessary, but they required to have the power.

Mr. HOLMES seconded the proposition, which was passed.

The SHERIFF moved—"That a special meeting of the Council be held a fortnight to-day, under Leeman's Act, for the purpose of providing the means to oppose the Company's Bill, if necessary." After that was done, a meeting of the ratepayers would, he said, have to be called.

Mr. W. SMITH seconded the motion, which was agreed to, and the Council shortly afterwards adjourned.

THE PURCHASE OF THE CARDIFF WATER-WORKS BY THE CORPORATION.

A Special Meeting of the Cardiff Town Council was held on Monday, the 27th ult.—the MAYOR (Mr. D. Lewis) presiding.

Alderman JONES moved—"That this meeting confirm the resolution passed at the meeting of the Council, held on the 13th day of January, authorizing the promotion of a Bill in the ensuing session of Parliament for the purpose of carrying into effect the arrangement with the Cardiff Water-Works Company, and for the other objects set forth in the said resolution." He explained that, in order to be regular, it was necessary that what had passed at the meeting referred to should be subsequently confirmed at this meeting. As, however, the subject had been fully discussed, he did not think it necessary to make any further observations; but, of course, it was open for any member to speak on the question if he chose to do so.

Alderman WINSTONE: We may say what we like, but we can do nothing. Is that what you mean? Is there not to be a public meeting?

Alderman JONES: Anybody who chooses can discuss the matter here. But the public meeting, which will be held in a few days, has nothing to do with this one.

Mr. T. REES seconded the motion.

Alderman WINSTONE said he strongly objected to the purchase of the water-works upon public grounds, because there was a proposal to spend £490,000. The Council had already laid out £150,000 upon town improvements, and it appeared, from the temper of the present Town Council, that they might very soon lay out £150,000 more if they had the chance. The Corporation would be, at this rate, in a very short time over a million pounds in debt, and be, in other words, thirty times more in debt than they had property. He could not see the necessity of purchasing the water-works. The town had had a good supply of water; and no material fault had been found with the Water Company. Yet the Corporation now proposed to go to Parliament for powers to borrow £490,000, to be paid back in 80 years, and, in the meantime, to pay something like £18,000 per annum interest. What would the town have for the £18,000 per annum? The water-works produced from every source £17,500, and, taking the sanitary expenses out of that, about £12,000 was left. Therefore, the Corporation would be paying £6000 for the privilege. Would this be for the benefit of the rising generation? It was said that the expenses would be recouped, that the population would so increase there would be a profit from the undertaking. But if 80,000 people consumed £12,000 worth of water, there must be something like 130,000 to consume £18,000 worth. It was impossible for Cardiff to become a great place if the rest of the country remained stationary, unless it was supposed that all the people in England were going there. Some time ago there were in the district 60 blast-furnaces in full work; 40 of them were now blown out, which represented a discontinuance of employment to 13,000 people, and the non-payment of about a million and a half of money. Was that a sign of increasing population? He then went on to state that the Company had received or would receive 12½ per cent. for their money, and no wonder that the Corporation were thought good customers. Better could not be found, nor bigger fools—if he might be allowed to use the term. At a time when creditors were becoming more numerous, when ready money was becoming less, and small shopkeepers were being ruined, he did not think the Corporation should enter upon this speculation. Indeed, he never thought of the purchase, but he was reminded of the story of the "Forty Thieves," in the "Arabian Nights." Being of opinion that the Corporation ought not to purchase the water-works, he moved that all expenses incurred up to this time be paid; that the Company be recouped for any loss they might possibly sustain; and that the scheme be immediately abandoned.

Alderman WATKINS said every argument had been used already, and the resolution to purchase had been carried with only one dissentient. He, therefore, thought it useless to reopen the question.

Mr. D. LEWIS wished to know if Alderman Winstone's statement about an expenditure of £490,000, was correct, as, if Llandaff succeeded in the opposition, he said that there was no doubt but that the water-works would have to be extended at Llanishen, and a new reservoir made.

Alderman BOWEN pointed out that Mr. Winstone had included the whole of the borrowing powers sought for in his statement—£325,000 was the amount required now.

Alderman JONES said he thought Mr. Winstone fully believed himself to be in the right; but he was mistaken. The transaction was a legitimate one in every way, and for the benefit of the town. Mr. Winstone had forgotten that the revenue of the water-works would go to pay the interest on the borrowed money, and as for the £490,000, that was made up by borrowing powers, which would enable the Corporation to extend the works in the future, if this were found necessary.

The resolution was carried, Alderman Winstone's being the only hand held up against it.

THE PROPOSED PURCHASE OF THE NEWINGTON (YORKS) WATER-WORKS.

Last Wednesday, a Meeting of Ratepayers of Newington was held—Mr. H. Ross in the chair—to protest against the purchase of the local water-works by the Newington Local Board of Health, that body having passed a resolution to seek powers in Parliament for the purchase of the works from the present owners, as reported in the JOURNAL for Dec. 24th last, p. 919.

The CHAIRMAN said he thought it would not be wise to purchase the works, because they had an agreement by which the Water Company were bound, for the next 15 or 17 years, to supply water at the rate of 5 per cent. on the rental value of the houses supplied. Having made a good bargain, he should be for sticking to it, and it would be unwise to entertain the question of purchase. Besides, the present time, owing to the number of empty houses in the district, was inopportune, and the purchase of the works now would entail much higher rates, and he believed higher water charges. There was another reason why they should not act rashly. It was known that the Corporation of Hull were about to bring in a Bill for the extension of the borough, and if Newington were included, the water-works there would be valueless, except as regarded the pipes.

Mr. R. BLACKBOURN moved the following resolution:—"That in the opinion of this meeting the proposed purchase of the Newington Water-Works by the Local Board would entail a very heavy burden upon the ratepayers, for which there is not the slightest reason or necessity, seeing that the district, by a solemn agreement with the Water-Works Company, is already secured a supply of water on reasonable terms, for many years to come. This meeting, therefore, earnestly protests against the proposed scheme, and pledges itself to use every means in its power to prevent such proposed purchase, and that a copy of this resolution be sent to the Local Board." He said they had been startled by a report that the Local Board had decided to seek powers to purchase the water-works. They would observe that the resolution involved two propositions—first, that the purchase would be a burden on the district, and, secondly, that there was no necessity for it. If the works were in the hands of the Board—and a Board could not manage them so well as private individuals—the expenses would swallow up the revenue. That being so, the cost of the works would have to be paid out of the rates of the district, and every ratepayer would have to contribute his quota. The water-works had to supply the district for the next 15 or 16 years at a certain figure, and that being so, what more did they want? The Company were also bound to supply Newland, and would the Board take upon themselves such a responsibility? He then traced the action of the Board, showing how rapid it had been. On the 16th of December a committee of seven members was appointed, to be called the Water-Works Committee, and they were empowered to enter into negotiations for the purchase of the water-works and all the appliances. They had never made any inquiry as to the revenue of the water-works, the value of the plant, or anything. They met three days later, and it was resolved that the clerk be instructed to negotiate with the Company for the sale of the works to the Board. On the 2nd of January they met again, and a deputation from the Company waited upon them; the matter was discussed, and the meeting was adjourned till three o'clock the same day, when a letter was read, stating that the Directors were willing to enter into negotiations for the sale of the works at a price to be fixed by an arbitrator appointed by the Board of Trade. It appeared that the matter required no discussion, for it was at once resolved that the Law Clerk write to Stockton, Middlesbrough, and Cardiff, where water-works had recently been acquired by the Authorities, for information, and whether they would receive a deputation from the Board. They would observe that in all this there was no word as to the revenue of the Company, their expenditure, or the probable cost of the works. He could quite understand the Company wishing to sell, but he could not understand the Board offering to buy without knowing the probable cost, the expenditure, and the condition of the works. He could not help thinking there was something at the bottom of it, and that commission-money had been offered on a sale being effected.

Mr. RAYMENT said he was a Shareholder in the Company, and he had never been asked whether he was willing to sell; in fact, he was not willing. There were 5300 shares in the Company, of which one gentleman held 2816, so that they ought, he thought, to sink the term "company" altogether, and say that this gentleman wanted to sell his water-works to the Board. The capital of the concern was £70,000, and it was not likely that they were going to sell at a loss, if it was a good thing. No doubt the price they would expect to get would be £100,000. That being so, they would have to pay £4000 a year for the suggested loan, and for the repayment of principal £2000 a year. This would need a water-rate of 11s. 2d. in the pound.

Mr. W. P. GARBUTT stated that the rateable value of the district had increased from £7500 to £28,000, and he did not doubt that when trade revived it would soon be increased to £60,000 or £70,000.

Mr. J. P. GRAY and Mr. S. WALLIKER very strongly opposed the proposed purchase, especially by arbitration, and the latter gentleman said that he had been informed that the cost to Middlesbrough, through going to arbitration, was £200,000 or £300,000 more than they would otherwise have paid.

An amendment, to the effect that the meeting approved of the course suggested by the Board; was put and lost, 25 voting for it, and 53 for the original motion.

Mr. RAYMENT then proposed the following resolution:—"That a committee be appointed from this meeting, to prepare a petition to the Local Government Board, asking them not to grant permission to the Local Board for the purchase of the water-works, and that such petition be signed by the Chairman on behalf of the meeting."

Mr. MASSEY seconded the motion, which was put and carried unanimously.

A vote of thanks to the Chairman concluded the proceedings.

ALTERATIONS AND IMPROVEMENTS AT THE SALFORD CORPORATION GAS-WORKS.

In the course of the past few months, alterations and improvements, on an extensive scale, have been commenced, and are now being carried out, at the gas-works, Regent Road and Liverpool Street, Salford, from designs prepared by the Engineer and Manager, Mr. S. Hunter, A.I.C.E. For a considerable period great inconvenience has been experienced with respect to the appliances for the manufacture of gas in Salford. This difficulty was caused principally by the purifying apparatus being inefficient, and totally inadequate to pass the quantity of gas produced, and required by reason of the greatly increased consumption in the district. With a view to remedy this state of things, the Town Council, on the recommendation of the Gas Committee, voted a sum of money for improvements, which are now being effected at a cost of about £160,000. The laying out of this sum will be extended over several years.

The first apparatus requiring immediate attention was the condensers, the old ones not being capable of dealing thoroughly with the large volume of gas which daily had to be passed through them. Additional condensing surface was deemed absolutely necessary, and accordingly a new combined air and water-tank condenser, of a more modern and economical construction, has been erected. It consists of five tiers of 12-inch pipes, with eight lines of pipes in each tier, the length of each line being about 50 feet. These tiers of pipes are supported by cast-iron standards carried on cast-iron beams placed over the water-tank. The upper tier of the 12-inch pipes is connected to a 24-inch receiving-pipe. The gas from the retorts enters this pipe, the gas and tar traversing the eight lines of 12-inch pipes simultaneously, and so continuing through the five tiers, or, in all, a total quantity of 40 lines of 12-inch pipes. After passing through the five tiers of pipes which comprise the air-condenser, the gas enters a similar 24-inch receiving-pipe, and is conducted into the inlet of the water-tank condenser, traversing the eight lines of 12-inch pipes immersed therein. The water-tank in which the last-named pipes are immersed is about 51 feet long, 15 feet wide, and 4 feet deep, formed of cast-iron plates bolted together. The joints of the plates forming the bottom and sides are all inside the tank, to admit of their being easily got at in case of leakage. The whole of the connecting-pipes surrounding the condenser are 24 inches in diameter, and, in themselves, assist condensation very considerably. These pipes are laid in a subway, covered over the top by cast-iron grating about 4 feet wide. They are thus kept cool, and the whole of the joints and valves are exposed. The air and water condenser, together with all the 24-inch connections, give a capacity equal to 150 square feet of condensing surface to each 1000 cubic feet of gas made per hour. The 12-inch pipes laid in the water-tank have, of course, a much greater condensing power than those exposed to the air. This condenser being fixed on an elevated portion of the works, advantage was taken of the position by arranging the supply of water to the retort-houses and other parts of the works from the tank, and this is beneficial to the condensers, there being thus a constant stream of water running through the tank, and at the same time not the slightest waste or misuse. The manner in which the valves and connections are arranged admits of the condenser being worked in various sections. It is quite under control for all temperatures, and may be put into or thrown out of action, according as the make of gas increases or diminishes.

The gas having passed through the condenser, is conveyed by 24-inch cast-iron pipes to a large cooler, 12 feet in diameter and 50 feet high, formed of cast-iron plates bolted together, comprising 10 tiers of plates, each 5 feet high. The gas remains in this cooler for a short period, and from the outlet it is carried by similar sized pipes to the exhausters. These consist of two double direct-acting pumps, with a small engine between them, secured to a massive foundation-plate. The pistons of the three cylinders work, by means of their connecting-rods, directly upon the crank-shafts, without the use of straps or intermediate gearing. This plan far supersedes that formerly in use at these works. In order to keep up a constant and equal delivery of gas, and maintain a steady gauge, the pumps are arranged to work at quarter-centre, so that when the piston of one cylinder is at its dead centre, the other is doing its greatest amount of duty, and *vice versâ*. The length of stroke of the pistons is regulated by a differential arrangement on the crank-plates, whereby they can be adjusted to pass any quantity of gas per hour, although the speed of the engine remains the same. Upon the inlet to the steam cylinder is fixed a valve, regulated by a governor, actuated by the inlet gas pressure. The crank-shaft, which is supported at four points, is provided with heavy fly-wheels. Either cylinder can be detached, if required, and the capacity of the apparatus is thus reduced one-half. The working power of the exhauster is therefore capable of being modified in several ways, or by a combination of two or more of them—namely, by the pressure of steam employed, by the quantity of steam admitted, by the length of stroke, or by working either cylinder singly. The apparatus is substantial in design, and the noise usually occasioned by machinery in motion is reduced to a minimum. The exhauster-house, in which the apparatus is fixed, is a building 30 feet wide and 45 feet long, faced in stock bricks, with stone dressings, being well ventilated and lighted. Additional light is also given from the ceiling by an ornamental ceiling light of embossed glass. The house is cellared to a depth of about 9 feet. This method admits of the whole of the gas and steam pipes and valves being repaired or replaced, if required, without disturbing the tiled floor of the engine-house above. The interior of the house is lighted by seven improved safety gas-lamps, fixed in the walls of the building, making them air-tight inside the house, ventilating the lanterns from the outside, and carrying off the products of combustion in a similar manner.

The gas, on leaving the exhauster, is forced by this machine through the washers, of which there are two, fixed side by side. Each comprises a large cast-iron tank, 16 ft. long by 8 ft. wide and 3 ft. 6 in. deep, in which are fixed horizontally a tier of very finely perforated plates. These tanks are partially filled with ammoniacal liquor, and to such a depth as to cover the perforated plates. The gas, entering the inlet chamber of the washer, forces its way through these fine perforations and the water, and thus the whole bulk of gas passing through this apparatus is divided, or split up into an endless number of very fine streams, resulting in the total removal of every trace of tar from the gas, and in the absorption of nearly all the ammonia.

The gas having gone through the process of washing, enters the scrubbers, which are 12 feet diameter and 50 feet high, with enclosed machinery-room on the top. At the level of the machinery-room floor, which is about 50 feet from the ground, an ornamental cast-iron projecting balcony is fixed, with suitable handrail. The balcony and machinery-room are reached by ascending a spiral staircase, fixed between the scrubbers. The interiors of the scrubbers are filled entirely with wooden boards, 6-inch by ⅜-inch thick, which are placed on their edges ¾-inch apart. Every alternate layer of boards is placed at right angles with the other. Thus the whole area of the scrubbers is divided, or cut up into spaces ¾-inch square. The connecting-pipes and valves to and from the scrubbers are 24 inches in diameter, and are laid in a similar subway to those of the condenser. The gas is made to enter the scrubbers at the bottom, being subdivided into numerous minute columns in its passage to the outlet-pipe through the openings formed by the intersections of the boards. The machinery-room before referred to contains an improved revolving distributing apparatus, which conveys the water and gas liquor in fine jets on to the boards at the top. Thus the water, in its descent, trickles over the whole of the surface of the boards, and the gas, in its ascent, meets the descending shower of water, extracting the last trace of ammonia. These ponderous vessels are neat in design, and, in the neighbourhood of the gas-works may be seen towering high above the adjacent buildings. The site selected for the scrubbers being in close proximity to the railway, extra precaution was requisite to obtain a sufficiently solid foundation to support such a mass of material, in order to ensure freedom from vibration caused by the heavy railway traffic now daily passing.

The last stage of purification is reached on the gas entering the purifiers, which are contained in a strong, plain, but substantial building, comprising basement and upper floor, 123 feet long and 78 feet wide, built of ordinary common red bricks, relieved with bands of Staffordshire blue bricks, with stone dressings. The height from the ground floor to the floor-line above is 16 ft. 6 in., and that of the upper room, from the floor to the springing of the roof, 22 feet; making a total height of 38 ft. 6 in. The basement floor is formed of concrete 10 inches thick, the upper floor being composed of 9-inch by 3-inch planking. The ceiling of the roof is formed of 1-inch boardings, laid diagonally, and covered with slates; the whole being supported by 14 strong wrought-iron ornamental principals. A raised ventilator, with louvre boards, extends the whole length of the ridge, surmounted at the apex by neat ornamental iron cresting. The building is provided with numerous large windows, the frames of which are of cast iron, each provided with a moveable ventilator. A skylight also runs nearly the full length of the roof, on each side of the apex, and this, with the windows on each side, makes the whole of the upper floor evenly lighted at every part. Around the sides of each purifier is fixed a water-lute, 2 ft. 9 in. deep, and 8 in. wide. This lute, or seal, is partially filled with water, and is for the purpose of receiving the wrought-iron cover, which, when lowered in the cavity, forms a perfect joint. A novel system of raising the purifier covers is introduced. It consists of four square-headed screws, one placed in a box at each corner of the vessel, and entering through the bottom. These screws pass through worm-wheel nuts, which are carried on fixings attached to the beams on which the purifiers rest, and the nuts are driven by worms keyed on to the shafts, running round three sides of each vessel, and which are actuated by a strap from the line shaft alongside of the wall of the building. The mode of working is as follows:—The strap is pushed, by means of a strap-guide, from the loose to the fast pulley; the shafts under the purifiers are put in motion, the worm-wheel nuts at each corner slowly revolve, thereby raising the four screws, and these coming in contact with the cover, weighing 10 tons, raise the latter to the required height. Wheels can also be attached to the sides of the cover to run on the top edge of the purifier, which admits of the cover being moved transversely if required.

The purifiers are six in number, each 30 feet square and 5 feet deep, formed of cast-iron plates bolted together. These ponderous vessels are supported by cast-iron girders and columns. Four of the purifiers are arranged internally with two tiers of wooden sieves, supported on T-iron bearers and small standards. On the first of these tiers of sieves is placed a layer of oxide of iron, about 10 inches thick, and on the upper tier a second layer 18 inches thick. The gas enters the centre of each purifier at the bottom, and passes down the outlet chamber communicating with the area above the second layer of oxide. It passes through three of the purifiers in succession in this way, becoming purer after leaving each vessel, and at the outlet of the third it is perfectly free from any trace of sulphuretted hydrogen. Under the previous management, the gas was delivered to the consumer at this stage; but in order that every trace of impurity may be arrested, it is passed through two purifiers of a similar size, each containing four tiers of ordinary dry lime, in layers 2½ inches thick. The fourth oxide purifier is always undergoing the process of re-charging, in order to be in readiness to be put in operation when the third, or last, becomes foul or dirty. The direction of the gas is changed by moving the cone of a 24-inch centre-valve a quarter of a revolution.

To charge the two layers in each purifier with oxide, considerable time and labour are saved by the use of the elevating machinery erected against the inside of the walls of the building. This consists of a broad strap passing round two large pulleys at an angle, one pulley being in the upper floor, and the other in the basement. On this strap are bolted iron buckets about every 3 feet apart. A trough in the basement, through which the buckets pass, is kept constantly supplied with oxide by a man in attendance. It is raised to the upper floor and tipped, or delivered into iron spouts having a radial motion, which enables the workman to deposit the material in any required part of each purifier, 45 tons being used in each box. A 10-horse power horizontal steam-engine, protected by a wood and glass screen, is fixed in one corner of the purifier-house, for driving the machinery, raising and lowering the covers, and for elevating the oxide and lime. When the purifying material is foul or dirty, it is emptied very cleanly and rapidly through two discharging-pipes fixed in the bottom of each purifier, through which the foul oxide is passed on to the basement floor, when it is frequently turned over and laid out evenly and exposed to the atmosphere. After two or three days of this treatment, it is thoroughly revivified, and again ready for use in the purifiers. In the new arrangement, the oxide is revivified in the area occupied by the house. A considerable saving is thus effected in the manipulation of the material, over the former system adopted at these works, when the whole of the oxide was shovelled out of the purifiers, and wheeled in barrows to an adjoining shed, where it was exposed for revivification. This necessitated the employment of a large number of men, besides occupying more than double the space. The whole of the purifying plant is of the most modern construction, each apparatus being proportionate with the other, and arranged in its respective positions in such a way as to utilize every available space of ground.

The foregoing comprises the extensions made up to the present time at the Regent Road works. Others are in contemplation, for providing additional carbonizing power, meter and governor houses, fitting-shops, stores, &c.

At the Liverpool Street works, the only extension going on at the present time is the construction of a gasholder and tank. The latter is very nearly completed, and is formed of brickwork built in Portland cement. It is 154 feet internal diameter and 40 feet deep, and adjoins the present holder and tank at this station. The gasholder is telescopic, 151 feet diameter, each lift being 40 feet deep. When the two sections are out, the

total depth of the holder will be 80 feet, or 20 feet deeper than the present one, and will contain 1,400,000 cubic feet of gas. The guide framing supporting the holder will consist of 16 cast-iron columns, each 3 ft. 6 in. in diameter, and 82 feet high, and connected together at top by 16 wrought-iron lattice girders, the joints being covered by large ornamental entablatures, while at a point about 40 feet up the column, another tier of similar girders will be fixed.

In reference to these extensions, one of the local papers says: "Now, it may be asked by our readers—and very naturally so—what are the advantages of this great outlay? One advantage—and we think that our readers will not deem it a mean one—is that the purifying power is four times greater than it was formerly, and, notwithstanding this enormous increase in the area and power of the purifiers, the cost of labour for working is not more than one-half or two-thirds that which was incurred by the old apparatus. The next question which may arise is, whether the outlay has been kept within the reasonable limits of the value received. This is shown most clearly by the published accounts of the Corporation, on reference to which we find that when the present Manager took charge of the works, the mortgage debt was £305,391; whereas we find that, by returns published on March 25, 1878, the mortgage debt was only £284,921. It may be supposed by some that as this money has not been provided on mortgage alone, other funds have been used to bear the burden. This does not appear to be the case, especially when we refer to the published accounts in 1876, when the balance to the credit of the depreciation-fund, works, and plant account, amounted to £3731; whereas in 1878 this was increased to £26,699. This addition is the more surprising as, during this period, there has been an increase in the consumption and sale of gas equal to about 40,000,000 cubic feet per annum. Not only does there appear to be a great improvement in dealing with the mortgage loans accounts, but, as we have before remarked, there is a decided increase in the profits realized. Formerly, as the Corporation well know, the difficulty was to 'make both ends meet;' but within the past two years, although the price of gas has been twice reduced, there appears to be an annual surplus of £25,000 or £30,000."

GAS ILLUMINATION.

By Dr. WILLIAM WALLACE, F.R.S.E.

At the Meeting of the Society of Arts last Thursday—CORBET WOODALL, Esq., M. Inst. C.E., presiding—a lecture on the above subject was delivered by Dr. Wallace, of Glasgow.

The CHAIRMAN, before calling upon Dr. Wallace, said: The interest attaching to this evening's lecture is due, I believe, largely to a matter outside the subject itself—the recent experiments made with the electric light. The illustrations we have seen of it in our public streets have created a degree of interest in the whole subject of artificial illumination, which is very desirable, but is certainly somewhat new. I am very glad we are able to have to-night a lecture on the subject of gas illumination, which will open up some very important questions as to the economical use of gas in the present and in the future. There has been, in the past, very considerable waste in the use of gas; but from whose fault, it is unnecessary now to discuss. This waste has not gone on to the extent it might have done, and we are very much indebted to certain gentlemen, of whom the lecturer is one, who have devoted to the matter a large amount of patient scientific inquiry, so as to make more perfect the burners through which gas is consumed. The importance of those investigations will become apparent when I say that there are in actual use, at the present time, burners that emit from the same amount of gas in one case, say, 100, and in another 50 per cent. of available light. Now, if you take the consumption of gas in London alone, I have no hesitation in saying that some economy might be effected, either in the money paid for the gas, or in the actual light obtained for the money spent—which was stated by the Gas Referees in 1871 to be equal to about half a million sterling. For these reasons, I rejoice very much that we are to have from our lecturer to-night some description of the work that he and others have done, and I have no doubt that the result of it will be to the advantage both of the users and makers of gas.

The Chairman then called upon Dr. Wallace, who proceeded to deliver his lecture, as follows:—

It is impossible to discuss the subject of gas illumination at the present time without making some reference to the electric light, which many authorities affirm is destined to be the light of the future. If this is so, it might naturally be inferred, by those who have only a slight knowledge of the subject, that it is only wasting energy to devote time and study to the improvement of gas lighting, since it must soon be superseded by the more brilliant light obtained from electricity. I have given this matter some attention, and I must say that I have no fear that gas interests will suffer, in consequence of the introduction of the electric light, for many, many years, if at all. The mere fact that light can be obtained by passing a powerful current of voltaic electricity between carbon points, dates back to a time when gas lighting itself was only in its infancy. It is now nearly 30 years since the apparatus was so far perfected, that the distance between the carbon points was worked automatically; and the improvements recently introduced, if we except the Jablochkoff candle, have been directed more to the effective production of electricity by mechanical power than to the light itself. Turning over an old periodical a few days since, I came upon a paragraph which I read with some little interest, in which it stated that a French *savant* had discovered a plan by which the unsteadiness of the electric light was removed. The date of this announcement is 1853—a quarter of a century since—and even now we are scarcely in a position to say that the unsteadiness of the light has been overcome. The fact is, that we have still a long period of experiment and study before us in regard to lighting by electricity, and although the march of improvement in science is now extremely rapid, I scarcely hope to live long enough to see electricity take the place of gas in the lighting of ordinary dwelling-houses. But even if I am in error in supposing that the enormous difficulties will not immediately be overcome, there is still little, if any, cause for alarm on the part of holders of gas stocks, since, even at the worst, gas is certain to be used side by side with electricity as long as coal can be obtained to produce it. The fears entertained recently by shareholders of gas companies remind me of the beginning of railway engineering, when it was asserted that if railways were allowed to be made there would no longer be any use for horses, and the valuable breeds of these animals in this country would be allowed to die out. We all know that the result was entirely the other way; the railways increased the demand for horses, and they became more valuable and more numerous than ever. Then, again, it was supposed that when gas was used for the lighting of towns, the manufacture of candles would cease. But what is the fact? More candles are made now than ever there was before, and, what is very much to the purpose in connection with my subject to-night, the greatest improvements in the manufacture of candles were made after the gas manufacture was fairly established. Even within my own recollection, candles were burned which required constant snuffing, and so late as 30 years ago artistic designs for snuffers and snuffer-trays were published in art journals. If electricity supplants gas for public lighting, as I believe it may at no distant date, it is all the more necessary that we should strive to get more light out of gas, either by improvements in the mode of manufacture, or by better means of burning it, or both, and I am very sanguine that gas lighting during the next 30 years will be developed to an extent of which we can at present form no adequate idea. We have seen some improvements in gas lighting already. What was at one time 12-candle gas, tested by the primitive Argand, became 14-candle gas with the Sugg-Letheby burner, and 16-candle gas with Mr. Sugg's "London" Argand; and all this without sensibly changing the quality of the gas, and, consequently, without conferring any benefit on the public. A real and substantial improvement in gas lighting would be one which would enable the public to get, in ordinary domestic life, something approaching to the illuminating power declared as the result of the official test; and the object of this lecture is to show what has been done up to the present time in this direction. Before passing on to my subject, however, I wish to make just one remark. If the production of gas is sensibly decreased, the value of the bye-products will proportionately rise, the demand for benzole, anthracene, tar oils, pitch, and ammonia will continue; and, if the quantity produced becomes less, the value of these important articles will undoubtedly increase.

Coal gas is a cheap source of light, the only real competitor in this respect being paraffin oil. The following table gives the comparative values, based on what may be accepted as average prices, although some of them may not be exactly correct at the present time:—

Cannel gas, 30 candles, at	4s.	2d.	per 1000 cubic feet.		1
Common gas, 16 candles	3	0	„ „		1¼
Paraffin oil	1	6	per gallon		1¾
Colza oil in moderator lamps	4	6	„		7
Stearine candles	0	10	per pound		27
Tallow	0	8	„		29
Paraffin	1	6	„		31
Sperm	1	6	„		36
Wax	2	6	„		72

In these comparisons, it is but fair to say, the gas is calculated as giving the light obtained when burned in the best-known manner, as in the official tests of the Gas Examiners of the towns where the respective qualities of gas are made.

It will be well to indicate, in a few words, the principle involved in the testing of various gas-flames and other sources of light. If a flame of any kind is held at any distance—say a yard—from a screen, in which an opening is made one foot square, and a second screen is placed at the distance of two yards, there will be thrown upon the latter a square figure, which, on examination, will be found to measure exactly 2 feet, and which has, therefore, an area of 4 square feet. If the second screen is moved to three yards, the illuminated portion will measure 3 feet square, representing an area of 9 square feet; at four yards it will measure 4 feet, giving an area of 16 square feet. We thus see that the space covered by the light increases in proportion to the square of the distance, while the intensity of light decreases in a corresponding degree. To put the matter more clearly to those who have not studied the subject, a flame at a given distance—say a yard—illuminates a given space, say a foot square; but at four times the distance the illuminating effect is diffused over 16 times the area, or 16 square feet; consequently, any single square foot at this distance gets only 1-16th part of the whole quantity.

I do not propose to enter into any details regarding photometers, all of which are based upon this principle, but I may explain the mode of testing by a simple illustration. I have a space of 100 inches, with a candle at one end, and a gas-flame, which I wish to test, at the other. I have a greased disc moving freely between the two, and by a little practice I can place it in a position in which the two sides are equally illuminated. I now increase the distance between the candle and the disc, and find it to be 20 inches, while that between the gas-flame and the disc is 80 inches; the square of 20 is 400, and of 80, 6400; and the one divided by the other gives 16 candles as the illuminating power of the gas-flame. In practice the photometer is divided so as to give the illuminating power by direct observation, and many details require to be minutely attended to in order to obtain reliable results.

We are in the habit of talking of certain qualities of gas—16 candles in London, 15 in Birmingham, 14 in Newcastle, 26 in Glasgow, 30 in Edinburgh; but these are not the values of the gas as burned in our houses, warehouses, and shops, but as burned in the manner calculated to give the highest illuminating power. These figures show the possibility of gas illumination, and represent the goal towards which we should strive. I freely admit that it is impracticable, not to say impossible, to obtain, in the every-day practice of common life, results as good as those got by means of appliances the most perfect for developing the full photogenic value of the gas; but still a great deal may be done to decrease the reckless waste of light that is certainly going on. I have no hesitation in saying that from 12 to 14 candle power might be obtained in every-day life from what is called 16-candle gas. We stand in a similar position with regard to various forces employed for practical purposes. The engineer calculates the power that should be obtained by the falling of a given weight of water through a given space; but the practical result obtained in a water-wheel always falls far short of the theoretical quantity. In like manner the force obtained by the combustion of one pound of coal in the boiler of your steam-engine is greatly less than the calculated figure. Still, mechanicians struggle on to obtain better results, and we are constantly improving. Some of the most recent forms of reaction-engines show an immense improvement on the water-wheels formerly in use; while, in regard to steam power, we have, in the performance of the best descriptions of compound engines, an approach to theory which was formerly deemed impossible of attainment. Such improvements represent so much money saved to the country; and it is equally the case with gas, but with this addition, that a decreased consumption, with the same amount of light, would give increased healthfulness to our dwellings, where the products of the combustion of gas constitute an evil of no small magnitude. It has been said that the man who causes two blades of grass to grow where only one grew before, is a benefactor to his country; and some honour is due also to him who enables us, by improvements in the steam-engine, to get out of one pound of coal the power which formerly required the combustion of two pounds, or who teaches us to obtain from 1 cubic foot of gas the illuminating value for which 2 feet had previously been expended.

When a porcelain slab is brought over a gas-flame, a deposit of carbon occurs; the particles exist in the flame, and the contact of the cold slab causes their instant deposition. A similar effect is produced by a current of cold air impinging upon a flame, a portion of which is thus cooled down below the temperature necessary for the combustion of the carbon, and the flame, thus exposed to the draught, smokes—that is, the finely divided particles of carbon pass into the air unconsumed. In ordinary circumstances, the carbon is consumed in the upper portion of the flame, and, if the jet is a good one, and the pressure of gas not too low, no smoke is produced. In the Bunsen burner the gas is mixed with air sufficient to prevent the separation of the carbon, and hence we have a flame which is valueless as a source of light, but convenient for the application of heat. The solid particles of carbon in an ordinary gas flame result from the

decomposition of the olefines and other compounds rich in carbon, and which are readily decomposed by the action of heat. The same thing occurs if coal gas be passed through a glass tube heated to redness by a Bunsen flame; in this case a copious deposit of carbon, or soot, in the interior of the tube occurs at the point where the heat is applied. In gas-works a similar effect is produced by the heating of the impure gas in the retorts, in which a deposit of carbon, sometimes 3 or 4 inches in thickness, is formed. It is this carbon that is used for the rods, or pencils, employed in producing the electric light. The pressure of the particles of carbon in a flame renders it opaque, and the degree of opacity varies with the illuminating power. At the bottom of a flat flame, where the oxygen is in excess, the transparency is such that a printed paper may be read through it as if no obstruction intervened; but the upper part almost entirely conceals the printing. The intensity of light depends partly upon the quality of the carbon particles, and partly upon the heat of the flame by which the carbon is brought up to a greater or less degree of incandescence. Professor Frankland has shown that the light is not entirely due to the separated carbon, and that certain chemical compounds—gases or vapours—from which carbon does not separate by the action of heat, are capable, under some conditions, of giving luminous flames when burned in air. For all practical purposes, however, the original proposition of Davy may be accepted, that the light is radiated from highly heated particles of solid carbon. When air is supplied in excess to a flame, as when the gas escapes through a fine jet at a high pressure, there is little separated carbon, the flame is transparent, or nearly so, and there is very little luminosity. On the other hand, when the flame is large and sluggish, and the air in contact with it is insufficient, the solid carbon is in excess, and a part of it escapes unburnt, giving rise to a smoky flame, in which also the luminosity may be low. What we have to strive after, in order to obtain the greatest possible "duty," as mechanical engineers would call it, from gas, is to burn it so as to have the flame as hot as possible, and as near the smoking point as is consistent with the perfect consumption of the carbon in the upper part of the flame. In few words, the whole science of gas lighting is the obtaining of a bright flame without smoke. It was at one time accepted as an axiom, that economy in gas lighting could only be obtained by the use of large burners, and that in small jets the contact of air was necessarily so complete that only a feeble light could be obtained. But this is only partially true; more precise and extended experiments having shown that the luminosity depends not so much upon the quantity of gas as upon the conditions under which it is burned. In the case of flat-flame burners, the most essential element is pressure—a high initial velocity giving also illuminating power, and *vice versâ*. I may give a few illustrations from my own experiments—the gas used being of 26-candles illuminating power for 5 cubic feet per hour. In all the instances I am about to quote, Bray's ordinary union jets were used. The gas gave the most unfavourable result when the smallest burner of the series, No. 0, was used under comparatively high pressure—1½ inches. Two cubic feet per hour gave an illuminating effect of 3·21 candles, or, calculated to the standard of 5 cubic feet per hour, 8 candles. The best result, on the other hand, was obtained with a No. 8 burner at 1-inch pressure, when 7·1 cubic feet gave an illuminating effect of 40·63 candles, or, for 5 cubic feet, 28·6 candles. Here is a striking contrast, the same gas giving at one time 8-candle power for 5 feet per hour, at another 28·6, the jets being respectively the smallest and the largest of the series of nine. But let us now take the same quantity of gas under varied conditions of pressure, and we shall see even here very marked differences. Three cubic feet burned at ½-inch pressure, and calculated to 5 feet per hour, gave 25 candles; at 1-inch pressure, 19 candles; and at 1½-inch, 12½ candles. Here we have the effect simply of pressure, which, in the case of flat-flame burners, is of paramount importance. When common gas is used, the effect of pressure is even more remarkable, the varieties being such that in some cases less than one-fourth of the possible amount of light producible is really obtained.

Dr. Wallace then went on to quote, with few exceptions, the whole of the report presented by him to the Dublin Meeting of the British Association last August, "On the Best Means for the Development of Light from Coal Gas of Different Qualities," and which appeared in the JOURNAL for Sept. 17, 1878, pp. 423–427. He concluded his lecture by referring to governors and regulators, about which he said: One of the difficulties connected with gas illumination is that the pressure in the mains varies considerably in different parts of a town, and at different hours of the day and night. One result is that a system of lighting adopted for a part of a town situated on a low level, will show inferior results in a more elevated situation. A rise of 10 feet gives, roughly, 1-10th of an inch of increase of pressure, so that it may easily happen that in the same town or city the pressure in one place may be 1 inch, while in another it may be 2½ inches. Again, the pressure of the gas, as sent out from the works, is altered from time to time, in accordance with the consumption, and as public works, shops, &c., are suddenly lighted up or extinguished at certain hours, private consumers are annoyed in one case by the falling off in the amount of light, and in the other by a flaring flame and hissing sound, both of which are very irritating. The cure for these evils is to be found in the use of governors or regulators. Every district of a town, the elevation of which is such as to affect appreciably the pressure of the gas, should have a governor, which may either be self-acting, to maintain a constant pressure throughout the day, or to vary sympathetically with the governor at the gas-works. Many of these have been invented, among which may be mentioned those of Cathels, Peebles, and Foulis. The pressure in the mains should not be reduced below 12 or 14-10ths of an inch; but, as even that is too high a pressure for the economical burning of gas, each house should have a regulator, in order to reduce the pressure constantly to about 7 or 8-10ths. Some of the regulators employed are dependent on the action of the gas upon a broad leather disc, attached to which is a ball and socket valve; while others have metal or glass bells floating in mercury, and acting upon a valve of the same kind. Both of these work satisfactorily when properly constructed. Among the best dry regulators are those of Sugg, of London, and Peebles, of Edinburgh; while the best mercurial governor that I have seen is that of Busch, of Oldham. In the case of public works and other buildings consisting of several floors, a regulator should be placed on each floor. Street-lamp regulators are of great importance, and much attention has been given to the perfecting of them by various ingenious mechanicians. The kind the largest number of which are in use at the present time resembles the dry house regulator already mentioned, the construction being quite similar. These little instruments are made by a great many gas engineers, among whom Sugg and Peebles may be named. The principle involved in the action of the apparatus will be at once understood by a glance at the sectional drawing I have placed upon the wall. It is a regulator, not of volume, but of pressure, and hence the quantity of gas consumed in any street lamp provided with it depends upon the burner. There is an objection to this regulator, and it is a serious one—the leather diaphragm becomes in time hard and stiff, and ceases to act freely; and, unless it be renewed at intervals, say, of 12 or 18 months, the instrument is by no means satisfactory. The next street-lamp regulator, in point of period of introduction, is Giroud's rheometer. This beautiful little instrument, which delivers a constant volume of gas, consists of a short cylinder containing glycerine, in which floats a bell of very thin metal, and formed at the top into a cone, the apex of which passes through an orifice in the cover of the cylinder. In the bell itself there is a small hole, through which the supply of gas to the burner must pass. An increase of pressure causes the bell to rise, and the cone to enter the orifice above, thus reducing the area of the aperture through which the gas has to make its way to the burner. The regulator of the rheometer is very perfect, but it ceases to be effective if the pressure rises above an inch, as in this case the gas passes through the glycerine and escapes in bubbles, giving a very disturbed flame. There is also danger of the orifice in the bell becoming moistened with glycerine, in which case it will either be reduced in area or be altogether closed.

The most recent street-lamp regulator may be called a dry rheometer. It delivers, like the instrument just noticed, a constant volume of gas; but the bell, or substitute for it, instead of floating in a liquid, is simply supported, while in action, by the pressure of the gas. A regulator of this kind is first indicated in the book published by Giroud, but I am not aware that he ever actually reduced his idea to practice. Victor Bablon, of Paris, patented, in 1875, "an apparatus for regulating the flow of lighting gas," in which the front, if it may be so called, is a disc of thin metal connected to a small hollow spindle. It has been introduced somewhat extensively in France, but is almost unknown here. It is, I understand, liable to derangement, owing to the tilting of the spindle to one side or the other of the tube through which it moves up and down. At all events, it is far inferior in its action to the "needle governor" of Peebles, which is, to my mind, the perfection of gas regulators. In a little cylinder stands a so-called needle, on the point of which rests a flanged cone of exceedingly thin metal. At one side of the cylinder there is a small tube leading away the gas, and the orifice of which is influenced in area by the action of the cone. The instrument, by means of a screw leading into the side tube, can be made to deliver any desired number of cubic feet, which it does with surprising accuracy, provided that the pressure of the gas is not less than 6-10ths of an inch. In trials that I have made, I have not found the variations of volume at different pressures to exceed 1 per cent. With such a regulator as this, it would be possible to employ Argand burners for street lamps. These burners, when of the best kind, are exceedingly sensitive to quantity of gas. If you have a Sugg or Silber Argand, regulated so as to be near the smoking-point, and so giving the highest illuminating value that the gas is capable of yielding, the smallest additional supply of gas will cause the flame to smoke. I have here one of Silber's Argands fitted to a needle governor, and you will have an opportunity of seeing the regularity of the flame under different conditions of pressure. I should have mentioned before, the needle governor the invention of Flürscheim, patented in this country by Borradaile in 1877; but it resembles Bablon's instrument so closely, that it is difficult to see any difference between them, except in the most trifling details.

One other description of regulator remains to be described—that which may be used in connection with the ordinary burners in our apartments. It must necessarily be small—in fact, it should not be much larger than the burner itself. Sugg has, for a number of years, supplied a regulator of this kind, consisting of a leather diaphragm, with ball and socket arrangement; but it is a little uncertain in its action, and, so far as my experience goes, very far from satisfactory. And, besides, it is too large to be useful, except as a part of a special system of lighting. Peebles has been endeavouring to reduce his needle governor to similar dimensions, and although he does not claim to have yet produced an altogether perfect instrument, in so far as it requires about the eighth of an inch of pressure to put it in action, he has great hopes that he will yet be successful.

In this lecture I have attempted to indicate the progress recently made in the way of developing the photogenic power of coal gas, and the direction in which further improvements may be looked for. I shall be glad if my remarks have the effect of attracting attention to a subject of such interest and importance.

Before concluding, I wish to make one other remark. Last night, on arriving in London, I saw the Thames Embankment illuminated by electricity, and was very well satisfied with the effect produced. Then I went across Waterloo Bridge, and saw the new lamps in the Waterloo Road, and I must say I was very much struck with the magnificent light afforded. That certainly was a step in the right direction, although I am of opinion that we are striving too hard to light up our streets brilliantly. I do not see any necessity for lighting up the streets to such an extent as to make them equal to daylight. What we want is to simply see where we are going, to avoid being robbed at night, and so on. Therefore, I think it is a great mistake to strive to make our streets as light as they are during the day. However, there may be economy in the use of these very large burners—and I think there is, though as I have not tested them, I am not able to speak positively. However, we are all very much obliged to Mr. Sugg for lending us those two lamps we have here to-night.

The CHAIRMAN: I think I shall best consult the convenience of the meeting if I call upon Mr. Sugg to make any remarks he may please in reference to the two very beautiful lamps he has lent us this evening.

Mr. SUGG: Before saying anything with regard to the large burners, I wish to make one or two remarks on some points referred to by the lecturer with respect to gaslights generally. In the first place, with regard to the Sugg-Letheby burner, which is the original burner used for gas-testing, I believe that it was the first burner in which gas was made to issue at a low pressure, it having very large holes. After that, other burners were made on the same model; but I think it was the first step in the direction of consuming gas under a low pressure. Then followed the burners of Brönner and Williamson, which were described by the lecturer. Those two burners included nearly every kind of flat-flame burner which had an obstruction to prevent the gas issuing too rapidly, with the exception of the hollow-top burners, which Dr. Wallace has not mentioned, and which I will endeavour to explain. [Mr. Sugg then drew a sketch of the hollow-top burner on the black-board, and explained that its shape made a flame taller, and consequently gave higher illuminating power.] I should say also, with regard to Mr. Leoni's burner, that the top is not made of steatite, but of adamas, which I believe is composed of magnesia and silicate of potash. It is a very hard substance, and is used for a variety of articles, but is totally distinct from steatite. Steatite is a kind of French chalk—a slippery stone, which, when found in the soft state, works uncommonly like ivory, and may be turned in a lathe; but when heated up to 2000° it becomes harder than the hardest steel, yet still retains its colour and form. It is therefore totally distinct from adamas, which is a material invented and made by Mr. Leoni. Adamas is a very good material for many purposes; but I do not think it is quite so good as steatite for gas-burners. With regard to the Silber burner, that is rather a delicate subject; but I think it only fair to say that the Silber burner is a Sugg burner. [Mr. Sugg then proceeded to make some remarks with regard to the Silber burner, which elicited some observations from Mr. Silber, and the Chairman therefore requested the speaker not to go into that question.] With respect to the flat-flame burners, I find that the lower you can get the pressure, the higher results you obtain in illuminating power, and that applies both to cannel and common gas. The burner you see before you now is burning cannel gas, and that is giving the

highest result which I think has been achieved by any burner. It is nearly 4½ candles per cubic foot of gas consumed. That is the way in which I always estimate the power of gas. You see that it does burn cannel gas, and that gas is only of about 22 candles illuminating power; therefore there is a difference between what would be the result of 22-candle gas and that which is equal to 30 candles. But I have found that even with the highest illuminating power you must have a low pressure to burn it, and you can only get that with an Argand burner. If you put the pressure higher, you do not obtain the same result in illuminating power. I now come to the question of these large burners. One is a double "London" Argand burner, and the other is a quadruple "London" burner. Every one of the principles on which the "London" burners are constructed is carried out in those large burners. They are each provided with a regulator, having a metallic disc so made as to fit inside a kind of cylinder, which has a play of nearly one millimètre round the disc, and, under ordinary circumstances, enough gas would pass round to supply the burner; but it is made tight in this way: In the inside of the piston there is a little groove turned, which is filled with oil, and the capillary attraction of the oil to the side makes that a perfectly tight joint under the pressure of the gas, which would not be more than 7 to 8-10ths. That keeps the joint perfectly sound, and the disc rises and falls according to the pressure. The tops of all these burners are made of steatite. They are the same as the "London" burner, only the number of rings is increased. At present we have made them with as many as four rings, and there will very shortly be one with five. One has been made with eight rings; but at present it is not perfect. That burner will give a light of from 1000 to 1200 candles.

Mr. Ford: I think, Sir, it would not be fair for this meeting to be brought to a close without some remark being made on the concluding observations of the lecturer. I do not think we should allow to pass unnoticed the statement of Dr. Wallace, that he regretted exceedingly the anxiety exhibited for more brilliant street lighting. I think all in this room ought to feel pleased that the question of street lighting has come forward so prominently as it has done at the present moment. It is the spirit in which this matter has been taken up by yourself, Sir, and your fellow-workers, that has caused a good attendance here to-night, by leading the public mind to inquire into this subject of street illumination, and to support gas engineers in developing and bringing gas lighting to that state of perfection which I am sure they can effect, as soon as the public are prepared to receive it. I believe that had it not been for the streets in Paris, and other places, being illuminated with the electric light, neither you nor any other Gas Engineer could have gone to the expense you have done in the Waterloo Road, and such as is now being incurred in many public buildings. I think the question of street lighting should be one of the first to come before all gas engineers, and I trust you will be supported by the corporate bodies; then private consumers will follow. They will see what you are doing; they will understand the value of gas, and you will obtain that support, without which you will never succeed in these excellent experiments you are making, which are so necessary to be carried out before we shall realize the true value and worth of gas.

Mr. Silber: It was not my intention to speak to-night, and my object in addressing you is not to criticize adversely those who have been occupied in improving the light produced by gas, but rather to compliment them on the progress which has been made, as shown here this evening. I do not believe we have ever seen a light produced from gas equal to that given by the two lamps which we have here to-night. There is no question that very great progress in this matter has been made. My knowledge of gas did not begin before the year 1869, but I have paid considerable attention to the subject since then, and I have come to the conclusion that the progress made has been most amazing. The construction of burners for consuming gas on a large scale, by the use of one, two, or even up to eight rings, is not a new idea; but the results, as shown here this evening, are new, because, in the burners formerly employed, it was considered that they should be made of particular lengths, which certainly rendered them totally unavailable for ordinary purposes—in fact, they were only suitable for lighthouse illumination. We undoubtedly have to compliment Mr. Sugg very much indeed for having brought before us such burners as we have here this evening; but the real question now is, are they practical? We have not come here to discuss the question of one maker's burners *versus* another maker's, but simply to discuss what is for the public use and benefit, and we must all be struck with the beauty of the light produced by the burner before us. Still we must put the practical question—Are these large lights desirable? Are these lights what we want for the illumination of our streets? That is really the question. The public would have to ask, "What do we obtain for our money? Do we obtain, by having a large light, giving from 200 up to 1000 candles, placed in one lantern, a better result than with the lights now employed, giving from 12 to 16 candles illuminating power, and consuming 5 feet of gas per hour?" That is really the question. We must also make a comparison with that which is now in the minds of everybody—namely, the electric light. However, we have the question of gas before us to-night, and I will deal with that only. I am under the impression that too large a light, concentrated in one spot, is decidedly a disadvantage, because pecuniarily you lose so much in the distance the light has to travel. I will not stay to give you the figures—which are well established, and which everybody who takes an interest in the subject may read for himself—of the enormous quantity of light lost in the distance it has to travel; but I believe, when the present agitation has passed over (for though the electric light will, I hope, be improved for the benefit of society at large, it is not shown that we can use it for practical purposes), that we shall not find the various councils who regulate all our local affairs will say we require these very large lights, be they electric or gas, because of the greater advantages attending their use. Mr. Sugg has shown some very good specimens of his burners, by which he produces a light equal to 16 candles in an Argand burner, and I think well-constructed lamps of that kind, giving 16-candle light, will be ample for street lighting purposes. He has also brought before us samples of street lamps, such as those used in Piccadilly, which are very good; but whether they will answer all the purposes required, I do not know. Still, the light is certainly ample for all our purposes. With regard to the question of burners, I may tell you that the theory was that, if you passed gas through a narrow channel, this was the only means of obtaining a light, without pressure. It is known to all those who are conversant with the subject, that gas burnt with the lowest possible pressure is burnt with the greatest advantage. I do not dispute that Mr. Sugg may have been the first, or one of the first, to introduce that system, and he was supported by some of the most scientific men in England who have studied the question. What did they state in a court of law? That gas, to be consumed advantageously, must pass through a narrow channel. That was after gas had been in use for 40 years. But what do you find now? You have that position entirely reversed, because, in this burner with a glass vase, you may have the opening as large as you please, and you actually obtain a better result by having a larger opening. This question is really a practical one, inasmuch as a mistaken theory has prevailed, not only in England, but has become almost universal, simply because some one started it, and no one called it in question, until Professor Wallace came forward and said, Why not construct a glass vessel which everybody can see? I do not blame any one for adopting that theory, and saying it can only be done in one way, when he has to support him the testimony of scientific men; but this burner shows that it is a mistake.

The Chairman: I am sure you will bear with me for one moment, while I ask you to pass a vote of thanks to the lecturer for the paper which he has read to us this evening. I quite agree with Mr. Ford that it is not for us or for our lecturer to say that we have attained exactly the amount of illumination that is desirable and necessary, either in the public streets or in our houses, and that beyond it, it would be extravagant to go. It is, in the first place, for those who have the lighting of the public thoroughfares to say how much light they require to have, and it is for us—trained, as we may be, by the greater luminosity given off from special centres by the electric light—to say how much we would wish to have in our houses. It is for us here to say in what way we can best secure, by the use of gas, such a quantity of light—be it large or small—as may be required, whether in the streets or in our houses. I think those present who are gas consumers—and I daresay that includes the entire number of the audience—will have found to-night some explanation of the very great differences which occasionally occur in their gas bills. It has been shown by Dr. Wallace that it may be possible for one man to have his house brilliantly and satisfactorily lighted for the same amount of money which another man spends who resides in an equally large house, and has an equal number of gas burners, yet is constantly grumbling. The importance of the question before us can hardly be over-estimated, remembering the enormous figures represented in the gas-rental for a year. I trust sincerely that, as far as gas companies can possibly do so, they will no longer leave the education of consumers, as to the best methods of using gas, entirely in the hands of outsiders; but that they will do their utmost to show how the article they supply can be most advantageously employed. I have much pleasure in proposing that the best thanks of the meeting be given to Dr. Wallace.

The resolution was carried unanimously.

Dr. Wallace, in reply, said: I am obliged to Mr. Sugg for the remarks he made. As to the hollow-top burner, I must say I knew of it. I omitted to describe it, although I had one on the table. I was not aware he was the inventor of it, and I am glad to learn that such is the case. With regard to the Leoni burner, I have stated in the paper that it is made of adamas. What Mr. Silber says with regard to pressure is perfectly right. I think, gentlemen, the gist of my paper this evening has been to impress upon you the fact, that in order to get, in any kind of burner, really good illuminating power, the pressure must be low. This, Mr. Sugg has been very eminent in producing, and the result he has shown you to-night. I will not detain you any longer, but only thank you for the kind attention you have given me.

The meeting then closed.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There is still a tolerably brisk demand for the better classes of round coal for house-fire purposes, but there is generally a less pressure of orders in the market, and it was only the continuance of the frost that kept this branch of trade in anything like an active condition. For gas-making coals the demand is now rapidly falling off, and consumers are simply working out their contracts, there being no fresh inquiries for this class of fuel at present in the market. There is but a very indifferent demand for all classes of fuel used in iron making and general manufacturing purposes. Steam and forge coals are bad to sell, and low in price; whilst in engine classes of fuel there is a good deal of pushing to secure orders, and contracts for slack are being placed at very low figures. The average quoted prices at the pit mouth are about as under:—Best house coal, 9s. 6d. to 10s. per ton; second quality, 7s. to 8s.; common round coal, 6s. to 6s. 6d.; steam and forge coal, 5s. to 6s.; burgy, 4s. to 4s. 9d.; and slack, 2s. 6d. to 3s. 6d. per ton.

There is still a moderately good demand for shipment, and prices are steady at about late rates.

In the iron trade, business is extremely dull, and there is still no indication of any early improvement. Lancashire makers of pig iron, although they are offering at lower prices than ever, are still considerably undersold by the outside brands coming into the district, and they are securing very few new orders of any importance, whilst scarcely one-third of the furnaces are in blast. For finished iron there is very little inquiry, and makers are competing keenly for business. Lancashire bars, delivered into the Manchester district, are quoted at £5 12s. 6d. to £5 15s. per ton, but for good specifications there are sellers at £5 10s. per ton.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The firmness in the coal trade of this district, reported last week, is maintained. There is no material alteration in price; the general tone of business, however, is better. Shipments of gas coals have improved. Several steamers have been engaged to load gas coals for Ireland. As we have stated previously, the gas coals for shipment are nearly all of best quality; but a fair medium sort is able to command a market. Steamers employed in this trade ran more regularly last week, the hindrance to navigation in the North Sea over most of January—fogs—having cleared away. A considerable number of steamers were chartered for London. The figure in no case exceeded 4s. 6d.; but the principal business was done at 4s. 3d. and 4s. 4½d. Small sailing ships to deliver gas coals at the wharves have been scarce; 6s. 9d. and 7s. per ton are the figures which have had to be paid to ready ships. There is an ample supply of steam tonnage for all the coasting ports. The freights are moderate, which greatly favours the sale of gas coals here for sea-borne purposes. Miners wages are coming down gradually in the county of Durham. On the Marquis of Londonderry's pit at Rainton, the men have offered to work an hour per day longer, and a reduction of 5 per cent. upon their wages, rather than the pit should be closed, and they should be thrown out of work. If the weather should be mild, of which there is a prospect this week, it is probable that the demand for household coals will fall off. The Northumberland steam collieries are doing moderately well. They, with all the other pits in Northumberland and Durham, are subjected to a keen competition from other districts. It is only by selling at low prices that they can keep their position in the market.

There were large arrivals of lead in the Tyne last week, from Spain. The lead importations from that country are very considerable. It is also being imported into the Tyne from Rhenish Prussia. Under these circumstances, the mines in the Teesdale, Tyneside, and Weardale districts find themselves hard pressed. The price of lead, therefore, keeps low in the market here.

The chemical market showed an improvement last week. The demand for chemicals from America increases, and the price of one or two articles advanced slightly. Fire-clay goods and fire-bricks have not been in much demand, and there is no advance in price. There is a prospect of an extension of the steel trade in the North of England. Some approved methods of manufacture have been suggested.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

A few days ago a meeting was held of the Committee appointed some months since to organize a proposed Gaslight Company for the town of Greenlaw. After some discussion, it was resolved that, owing to the altered circumstances consequent upon the failure of the City of Glasgow Bank, and to the [alleged] probability that the electric light will come in place of gas, no further action be taken in the meantime to carry out the proposed scheme. It is stated that the movement met with a liberal response on the part of the public, and no difficulty was found in the matter of funds, nearly all the shares being taken up. The convener, Mr. T. P. Purves, was awarded a hearty vote of thanks for his indefatigable exertions in promoting the interests of the movement.

Last Wednesday evening, Mr. William Arnott, F.C.S., Edinburgh, delivered a lecture on "Artificial Light" to the members of the Mechanics Institution, Brechin. After describing how coal gas was made, and of what it was composed, the lecturer showed several experiments with other lights, and exhibited the electric light, explaining how it was produced. He expressed his opinion that gas shareholders need not be afraid, as he felt quite sure the electric light would never be so handy as gas, and could only be applied in the lighting of streets and large open spaces.

A meeting of the Committee of Management of the Arbroath Gas Corporation was held last week, when, after some discussion, it was resolved that in future all service-pipes for new houses should be fitted up to the satisfaction of the Manager. In connection with gas affairs in Arbroath, I may mention that Mr. Terrace, the Manager of the gas-works, has just issued a short code of "Instructions to Gas Consumers," printed on a small card. The practical and very valuable hints which he throws out deal with such subjects as burners, pressure-regulators, gas-shades, meters (where to be placed, and how to be protected during frost), service-pipes, gas-fittings, and gas-stoves for cooking and heating purposes.

A few days ago the *Dundee Advertiser* drew attention prominently to the use of gas-engines, one of which has just been started in a sack manufactory in Dundee. Although it is an engine of only 8½-horse power nominal, it drives 18 heavy sack-sewing machines, a sack-cutter, hoist, &c., and seems to give great satisfaction.

The electric light is still exciting a certain amount of attention in Scotland. A writer in one of the Glasgow daily papers discusses the question of "The £. s. d. of Electric Lighting." He says the battle between gas and electricity as a lighting power has at length begun in earnest, and that the champions of "use and wont" have neither lost heart nor hope, is evidenced in the fact that gas shares have risen considerably above the low price they had reached on the occasion of the scare. Further on he says—Why our Municipal Authorities have yet made no move in the matter of electric lighting is inexplicable, while nearly every important city and town in the kingdom has already moved in the matter, either in the way of experiment, for by the fitting up of permanent bases of electric illumination. He does not seem to know very well what has been done to show the relative cost of illumination by gas and electricity, and his remarks, therefore, fall somewhat pointless. It is reported from Dundee that the electric light has been tried during the past week in the famous Camperdown Linen-Works, and it is affirmed that while the light was displayed the workmen carried on their usual operations with nearly as much facility as in the daytime.

A small lot of the Edinburgh and Leith Gas Company's stock was disposed of last Friday at £29; and, on the same day, the Glasgow Gas Corporation 9 per cent. annuities were advanced £1, remaining firm at £207. Business was done on Friday in Glasgow Water Corporation 4 per cent. annuities at £100¼.

The Glasgow pig iron warrant market has been steady during the week, but only a moderate amount of business was done. The prevailing dulness acts adversely upon the market, and the despondent feeling leads to an expectation that even lower prices will yet be reached. There is, however, a steady flow of buying for investment, which readily absorbs all the iron offered in the market. The closing prices on Friday were—sellers, 42s. 7d. cash, and 42s. 8d. one month; and buyers, 1d. per ton less. Manufactured iron is, if possible, worse than ever. Manufacturers continually undersell each other, in order to keep their works partially employed.

Practically no change can be reported in the Glasgow coal market. The shipping department shows no improvement, and the house demand is just about the average. Prices remain unchanged.

VENTNOR GAS AND WATER COMPANY.—Mr. W. T. Leach, who has for more than two years been Manager to the Ventnor Gas and Water Company, has recently absconded, taking with him some money belonging to the Company. The amount is small, but the Directors have had a good deal of trouble, owing to Leach having neglected to make up the books for the past half year, and to his leaving the Company's papers in a confused state. Everything has now, however, been put straight by Mr. Alfred Lass, the Company's London Accountant, and the annual general meeting of the Company will be held in a few days.

OPENING OF THE SOUTH HANTS WATER COMPANY'S WORKS.—The contract held under the provisions of the South Hants Water Company's Act, which was obtained last year, for the purpose of supplying most of the rural parishes in the Southern Division of the County of Hants with an abundantly pure supply of water through the chalk hills at Michelmersh, having been completed, the ceremony of turning on the mains took place at Romsey last Thursday, in the presence of a large number of representative gentlemen from nearly every part of the county. No inconsiderable amount of interest was excited in the proceedings, from the fact of the Company having already taken advantage of the powers conferred upon them by Parliament, and conveyed their pipes into a large number of the rural districts in the county, the area over which the mains are already laid extending to about 30 miles. Shortly after one o'clock on Thursday afternoon, the two hydrants which were erected on either side of the Square in Romsey, and connected with long lengths of hose and branch terminals, were taken possession of, one by the Right Hon. W. F. Cowper-Temple, M.P., and the other by Lord Henry Scott, M.P., who simultaneously turned on the standards, and immediately two powerful jets of water were sent up into the air, amid considerable cheering. For about half an hour the water was played over the buildings in the Square, and also sent over the Abbey Church, a height of about 60 feet, however, not being exceeded at any time during the ceremony. By the invitation of the Directors of the Company, the visitors afterwards adjourned to the Town Hall for luncheon, which was laid out in the Council Chamber. The whole of the day's proceedings were a marked success.

OPENING OF NEW WATER-WORKS AT LEAMINGTON.—Last Saturday, the new water supply for Leamington was turned on to the town, and will be permanently continued, if nothing unforeseen occurs. At present it must be regarded as an experiment, the water being conveyed into the reservoirs, in order that the engines and machinery may be fully and properly tested; the formal opening not taking place until Mr. Jerram and the consulting engineers have tested the machinery in every possible manner. Arrangements for securing an adequate supply have been made, in case of any unexpected stoppage at the new works. The expeditious manner in which Messrs. Young and Co., of Nine Elms, London, have carried out the work, deserves high commendation, and equal praise is due to the Engineer, Mr. Jerram, for the attention and ability which he has given to the work. The Mayor (Mr. W. Harding), Alderman S. T. Wackrill, and a few friends, with the borough officials, visited the works last Thursday evening, on the occasion of the "christening" of the engines. The ceremony was performed in the usual manner, by breaking a bottle of champagne over each engine. The engine nearest the reservoir was named "Harding," and that on the west side of the engine-house was called "Wackrill." The Mayor started his engine immediately before giving it a name, and Alderman Wackrill, as Chairman of the Water-Works Committee, did the same with the engine bearing his name. "Success to the new water-works" was then drunk, amid the enthusiastic cheers of the workmen, who also gave hearty cheers for the Mayor, Alderman Wackrill, and the Borough Surveyor. The Mayor called for cheers for Messrs. Young and Co., the contractors, and Mr. Robertson, their Manager, which were heartily given. Mr. Robertson, on behalf of the Contractors, expressed his thanks to the Mayor and Alderman Wackrill for their kindness in attending that night. He said he need not tell them that Messrs. Young and Co. had done everything they could to complete the work, having spared no efforts or labour to finish it in the most workmanlike manner, and that night they had some proof of their success. They had met with every kindness from the people of Leamington, and he trusted that the authorities would be thoroughly satisfied with the way in which the undertaking had been completed. Mr. Robertson paid a high compliment to the Borough Engineer, and said that Mr. Jerram had displayed conspicuous ability and untiring energy in the discharge of his duties.

Share List of Gas and Water Companies.

(*Corrected by Mr. F. N. GOLDING, Sun Court, Cornhill, from the latest Stock Exchange Quotations.*)

Number of Shares issued.	Amount per Share.	Name.	Amount paid up per Share.	Last Divd. p.Cent. p. Ann.	Latest Quotations.	Number of Shares issued.	Amount per Share.	Name.	Amount paid up per Share.	Last Divd. p.Cent. p. Ann.	Latest Quotations.	Number of Shares issued.	Amount per Share.	Name.	Amount paid up per Share.	Last Divd. p.Cent. p. Ann.	Latest Quotations.
	£	GAS COMPANIES.	£ s. d	£ s. d	£		£	GAS COMPANIES.	£ s. d	£ s. d	£		£	GAS COMPANIES.	£ s. d	£ s. d	£
589892	10	Alliance and Dublin	10 0 0	10 0 0	15½—16½	6200	5	Georgetown, Guiana	5 0 0	7 0 0	..	12500	5	Singapore (Limited)	5 0 0	7 10 0	5½—5¾
10000	20	Anglo-Romano . .	20 0 0	10 0 0	21—23	300000	100	Glasgow Corporation Gas	100 0 0	9 0 0	205—210	2000	5	Do., preference .	5 0 0	7 10 0	5¾—6¼
5000	20	Bahia (Limited). .	20 0 0	3 0 0	10—12							4000	50	South Metropolitan	50 0 0	11 10 0	92—97
1000	20	Do., do., redeem.	20 0 0	10 0 0	25—27	115000	100	Do., do.	100 0 0	6 15 0	..	4000	12½	Do.	12 10 0	11 10 0	23—24
1500	20	Do., 2nd pref. . .	20 0 0	7 10 0	20—22	..	100	Grimsby Gas, A. .	100 0 0	..	182—187	20000	12½	Do., new shares .	12 10 0	11 10 0	23—24
40000	5	Bombay (Limited).	5 0 0	7 10 0	5¾—6¼	..	10	Hampton Court . .	10 0 0	10 0 0	13—14						pm.
10000	5	Do., fourth issue.	4 0 0	7 0 0	½—1 pm.	7800	10	Hong Kong (Lim.)	10 0 0	10 0 0	14—16	15000	10	Surrey Consumers.	10 0 0	10 0 0	17—19
5000	20	Bournemouth . . .	10 0 0	7 0 0	..	5000	10	Hornsey	10 0 0	10 0 0	..	10000	10	Do., new	8 0 0	10 0 0	5—7 pm.
229700	..	Brentford	100 0 0	9 0 0	150—160	2000000	50	Imperl. Continental	100 0 0	5l. p.sh.	175—180 xd.	..	5	Tottenham and Edmonton	5 0 0	10 0 0	7—8
..	..	Do., 5 per ct. pref.	100 0 0	5 0 0	93—96			Kingston	..	..	..	1500	10	Wandsw. & Putney	10 0 0	10 0 0	14½—15
..	20	Do., C shares . .	16 0 0	9 0 0	7—8 pm.	..	..	Lea Bridge	..	..	11—12	1500	10	Do.	10 0 0	7 10 0	10¾—11¼
5400	20	Brighton	20 0 0	10 0 0	30—32	..	..	Limerick Gas . . .	4 0 0	3 15 0	2—2½	4000	10	Do.	10 0 0	7 0 0	..
5000	20	Brighton and Hove	20 0 0	10 0 0	32—35	9000	4	Liverpool United .	100 0 0	..	150—152	26000	5	West Ham	5 0 0	10 0 0	7—8
14000	20	British (Limited) .	20 0 0	10 0 0	34—36	561004.	100	Do., B	100 0 0	7 0 0	120—123	..	..	West Kent	..	..	..
7223	20	Cagliari (Limited).	20 0 0	7 0 0	16—18	1691004.	100	London	100 0 0	10 0 0	180—185	..	..	Woolwich, Plmstd., and Charlton . .	..	10 15 0	..
1500	10	Colney Hatch . . .	10 0 0	5 0 0	7—8	3865004.	Sk.	Do., B	100 0 0	6 0 0	122—124						
55000004.	Sk.	Commercial	100 0 0	10 10 0	184—188	1500004.	Sk.	Do., 1st pref. . .	100 0 0	6 0 0	122—124						
700004.	Sk.	Do., 7 per cent. .	100 0 0	7 10 0	115—125	8550	Sk.	Do., 2nd pref. . .	100 0 0	6 0 0	100—106						
20000	20	Continental Union.	20 0 0	6 10 0	18½—19½	7622	25	Do., A shares . .	25 0 0	6 0 0	29—31						
22000	20	Do., new	14 0 0	6 10 0	2–1 dis.	266924.	Sk.	Do., Debent. stk.	100 0 0	5l. & 6l.	..						
10000	20	Do., preference .	20 0 0	7 0 0	22—23	15000	5	Malta and Mediterranean (Limited).	5 0 0	2 10 0	1¾—2¼	615600	100	WATER COMPANIES. Chelsea	100 0 0	6 0 0	150—153
750004.	Sk.	Crystal Palace Dist.	100 0 0	10 0 0	175—180												
1250004.	Sk.	Do., 7 per cent. .	100 0 0	7 0 0	120—125	6000	5	Do., preference .	5 0 0	7 10 0	5—6	1624700	100	East London . . .	100 0 0	6 0 0	148—152
400004.	Sk.	Do., preference .	100 0 0	8 0 0	115—120	20000	5	Mauritius (Limited)	2 5 0	3 6 8	1¾–1¼ dis	10798	50	Grand Junction . .	50 0 0	5 0 0	81—85
7100	25	Edinburgh	25 0 0	10 0 0	43—46	27096	20	Monte Video (Lim.)	20 0 0	8 0 0	14—15	5840	25	Do., ¼ shares . .	25 0 0	5 0 0	41—43
23406	10	European (Limited)	10 0 0	10 0 0	15½—16½	8000	10	Nictheroy, Braz. (L.)	10 0 0	5 0 0	..	6160	25	Do., new ditto; max. div., 7½ p.c.	25 0 0	5 0 0	35—37
12000	10	Do., new shares.	7 10 0	10 0 0	4—5 pm.	30000	5	Oriental (Calcutta).	5 0 0	9 0 0	6—7						
35406	10	Do., new shares .	5 0 0	10 0 0	3—4 pm.	30000	5	Do., new shares .	3 10 0	9 0 0	¾–1¼ pm.	5551804.	100	Kent	100 0 0	8 0 0	207—215
40963004.	Sk.	Gaslight & Coke A.	100 0 0	10 10 0	185—190	10000	5	Ottoman (Limited).	5 0 0	3 0 0	2—2½	7818004.	100	Lambeth	100 0 0	6 5 0	150—153
1000004.	Sk.	Do. B.	100 0 0	4 0 0	73—78	10000	10	Pará (Limited) . .	10 0 0	3 0 0	4¼—5½	3261504.	100	Do., max., 7½ p.c.	100 0 0	6 5 0	145—150
50000	10	Do. 5 per ct. pref. conv., 4th issue.	10 0 0	5 0 0	16¾—17½	27000	20	Phœnix	20 0 0	10 0 0	35—37	442	100	New River	100 0 0	7 0 0	320—350
						3500004.	100	Do., new max. 7½	80 0 0	7 10 0	90—100	4475	100	Do.	85 0 0	7 0 0	280—300
50000	10	Do. do., 5th do. .	10 0 0	5 0 0	15½—16½	1440004.	Sk.	Do., capitalized .	100 0 0	5 0 0	100—105	400000	100	Do., deb. sk., 4 p.c.	100 0 0	4 0 0	101—103
2000004.	Sk.	Do. C 10 p.c. pref.	100 0 0	10 0 0	206—210		20	Do., new, 1876. .	16 0 0	10 0 0	12–14pm	6668004.	100	Southwrk. & Vauxh.	100 0 0	4 0 0	109—112
3000004.	,,	Do. D do. do. .	100 0 0	10 0 0	206—210	..	..	Richmond (Surrey)	..	..	..	3247004.	100	Do., pref. stock .	100 0 0	5 0 0	113—116
1650004.	,,	Do. E do. do. .	100 0 0	10 0 0	206—210	37500	20	Rio de Janeiro (L.)	20 0 0	10 0 0	23—25	1265004.	100	Do., D shares . .	100 0 0	4 0 0	107—109
300004.	,,	Do. F 5 do. do. .	100 0 0	5 0 0	100—105	1500	32½	Shanghai	32 10 0	12 0 0	..	700004.	100	Do., new ordinary	..	4 10 0	..
600004.	,,	Do. G 7½ do. do. .	100 0 0	7 10 0	150—160	..	100	Sheffield, A	100 0 0	10 0 0	184—186	1600	100	Do., new ord. No. 1	40 0 0	4 10 0	..
13000004	,,	Do. H	100 0 0	7 0 0	134—136	..	100	Do., C	100 0 0	10 0 0	176—178	15073	61	West Middlesex . .	61 0 0	5l. p.sh.	137—140

APPLICATIONS FOR LETTERS PATENT.

206.—Barker, G., Birmingham, "Improvements in gasholders or gasometers." Jan. 18, 1879.

211.—Rapieff, J., Middle Street, London, "Improvements in the means of producing and applying electric currents for lighting and other purposes, and in apparatus employed therein." Jan. 18, 1879.

242.—Ganster, G. P., Reading, U.S.A., "Improvements in means for lighting and extinguishing gas lights, and in apparatus connected therewith, parts of which improvements are applicable to clocks or analogous time-keepers or indicators." (Complete specification.) Jan. 21, 1879.

245.—Crompton, R. E. B., Queen Victoria Street, and Willans, P. W., Bow, London, "Improvements in apparatus employed in electric lighting." Jan. 21, 1879.

259.—Grieve, T. W., Drury Lane, London, "An improved lamp or apparatus for shading the electric and other lights, and for producing various effects of light for scenic and other purposes." Jan. 22, 1879.

277.—Cohné, S., Gracechurch Street, London, "A new or improved electrode or electric candle for the purpose of lighting by electricity, and effecting the divisibility of the electric light." Jan. 22, 1879.

299.—Haddan, H. J., Westminster, "Improvements in apparatus for producing light by electricity and other means." A communication. Jan. 24, 1879.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

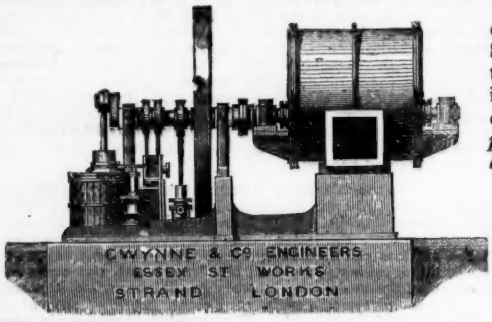
3056.—Leichsenring, H. R., Grossenhain, Germany, "Improvements in and relating to engines worked by gas or other fluid, partly applicable to apparatus for compressing fluids." Aug. 2, 1878.

4006.—Jensen, P., Chancery Lane, London, "Improvements in electric lighting apparatus." A communication. Oct. 10, 1878.

4502.—Brewer, E. G., Chancery Lane, London, "Improvements in lighting by electricity." A communication. Nov. 7, 1878.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

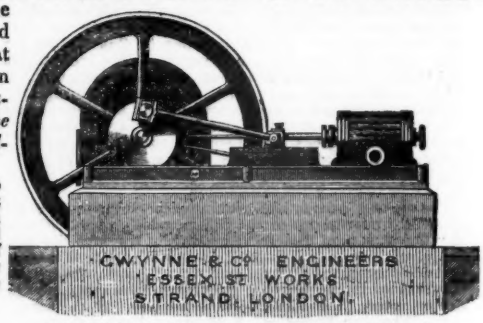
GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

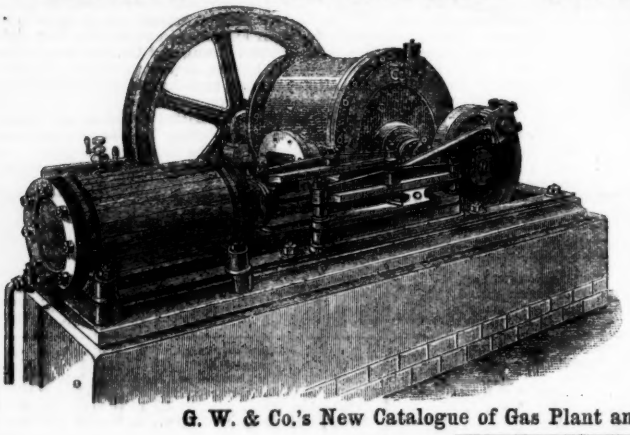
Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS

WITH

Wrought-Iron Spindles and

ENGINES COMBINED.



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MAKERS OF ENGINES, EXHAUSTERS, INDEX AND DISC GAS-VALVES, HYDRAULIC MAIN VALVES, BYE-PASS VALVES, TAR, LIQUOR, AND OTHER PUMPS, SCRUBBERS AND PURIFIERS, CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

Phœnix Engineering Works:

HOLLAND STREET, SOUTHWARK, S.E.

WET AND DRY GAS-METERS,

As supplied to The Gaslight and Coke Company, of London, the South Metropolitan, and other principal Gas Companies,

BY THE

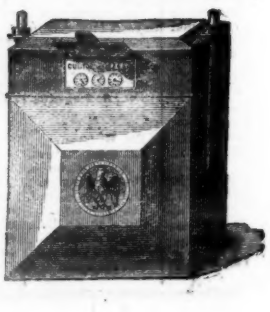
IMPERIAL METER COMPANY,

LIMITED.

MANUFACTURERS ALSO OF

Station-Governors, Consumers Dry Governors,

STATION-METERS, STREET-LAMP METERS, &c., &c.



WORKS:

KING'S ROAD, ST. PANCRAS, LONDON.

WANTED, by Advertiser, a Situation as Working FOREMAN or Inspector, Collector, and Meter Fixer, &c.

Address No. 523, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a young Man, aged 22, who has had five years experience in a Provincial Works (make, 75 millions), a SITUATION in a Gas-Works. Can use Photometer, fair Draughtsman, good Writer, quick at figures, and thoroughly understands general routine.

Apply S. I. C. E., 54, Hardress Street, RAMSGATE.

WANTED, a Situation as Gas Manager. Had over 20 years experience, and 8½ years in present employment. Understands all branches connected therewith. Good testimonials. Satisfactory reason for change.

Address No. 522, care of Mr. King, 11, Bolt Court, Fleet Street, LONDON, E.C.

WANTED, by an experienced Man, a Situation as MANAGER of small Gas-Works. Has had considerable experience in the Manufacture of Gas, Retort Setting, Main and Service Laying, and Gas-Fitting. Well up in the Manufacturing and Distribution of Gas. Can produce good testimonials, and give satisfactory reasons for leaving present situation.

Address A. B., Mill Lane, Castle Cory, near Bath, SOMERSET.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c ,&c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

MANAGER of Tar and Ammonia Distillery will be disengaged on the 10th of February, and will be open for RE-ENGAGEMENT.

Advertiser has a good practical knowledge of the business, and is a steady, energetic man.

Address No. 520, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CHEMICAL WORKS TO LET.

THE Burnside Chemical Works, Ayr, for the distillation of Gas Tar and Water, Manufacture of Sulphate of Ammonia, Naphtha, Oil, Pitch, Lamp Black, &c.

The Works are presently occupied by Messrs. Walker and Son, and are very conveniently situated for communication by rail and sea.

Apply to JAMES CAMPBELL, Writer, SALTCOATS.

TO GAS COMPANIES.

THE Gas Committee of the Blackburn Corporation are prepared to receive OFFERS for a TELESCOPIC GASHOLDER, 60 ft. in diameter, and Two 20 ft. LIFTS; also Cast-Iron TANK for the same 61 ft. 6 in. in diameter and 20 ft. deep, with all Pillars, Girders, Inlet, and Outlet, all complete.

Can be seen working, and all information required can be obtained, on application to the undersigned.

SAMUEL E. OGDEN, Engineer.

Gas-Works, Blackburn.

AMMONIACAL LIQUOR.

THE Directors of the Exeter Gaslight and Coke Company are prepared to receive TENDERS for the whole of the AMMONIACAL LIQUOR produced at their Works for One year from the 25th of March next.

Contractors to state price at per 1000 gallons of 6 degrees Twaddel, delivered into tank at the Company's Works; and sealed tenders, endorsed "Tender for Ammoniacal Liquor," to be sent to me, the undersigned, on or before Monday, the 17th day of February next.

The Directors do not bind themselves to accept the highest or any tender. By order,

W. A. PADFIELD, Secretary.

Gaslight Offices, Exeter, Jan. 9, 1879.

TENDERS FOR TAR.

THE Gas Committee of the Dewsbury Corporation are prepared to receive TENDERS for One, Two, or Three years (as may be agreed upon) commencing on the 1st of March next, for the purchase of the Surplus TAR produced at their new Gas-Works, Savile Town, which are situated close to the canal. Quantity of Coals carbonized, 13,000 tons per annum. Any further information may be had on application to the undersigned.

Sealed tenders, endorsed "Tender for Tar," to be sent to Jesse Smith, Esq., Town Clerk, on or before the 18th of February next.

The Committee do not bind themselves to accept the highest or any tender.

CHAS. ARMITAGE, Engineer and Manager.

Gas-Works, Dewsbury, Jan. 29, 1879.

W. HAILES, Furnace Builder and Retort Setter, Contracts for the Erection of Retort Benches, Settings of Retorts on all the most improved principles, in large or small works. 20 years experience both in London and Provinces. Price List on application.

Address 3, High Street, Brentford, MIDDLESEX.

KEIGHLEY LOCAL BOARD OF HEALTH.

EXHIBITION OF GAS APPARATUS.

THE Gas Committee of the above Board have determined to hold an Exhibition of Gas-Engines, Stoves, Ovens, Burners, and other Appliances for the economic use of gas, on Wednesday, Thursday, Friday, and Saturday, the 19th, 20th, 21st, and 22nd of March next, in the large Hall of the Mechanics Institution, Keighley. Room, gas, and connections will be provided by the Committee free of charge.

Applications from Manufacturers of Gas-Engines, Stoves, &c., and others, for space, must be made on or before the 1st of March to the undersigned, at the Gas Office, Low Bridge, Keighley, from whom full information can be obtained. By order,

JOHN LAYCOCK.

Keighley, Jan. 24, 1879.

FROME WATER-WORKS.

CONTRACT No. 1.—CAST-IRON PIPES.

THE Local Board for the district of Frome are prepared to receive TENDERS for the Manufacture and Testing of about 600 Tons of CAST-IRON PIPES, to be delivered at Frome Railway Station, in Somersetshire.

Specifications and forms of tender can be obtained at my Office in Frome, or at the Office of the Engineer, Mr. Henry Tomlison, 4, Bene't Street, Cambridge; and sealed tenders must be sent in to me, endorsed "Tenders for Pipes," not later than Twelve o'clock at noon on Wednesday, the 5th day of February next.

The Board do not bind themselves to accept the lowest or any tender.

GEO. W. BRADBURY, Clerk to the Board.

Bath Street, Frome, Somerset, Jan. 22, 1879.

THE CHORLEY IMPROVEMENT ACT, 1871.—AS TO GAS-WORKS.

CONTRACTS FOR CANNEL AND COAL.

THE Chorley Commissioners are desirous of receiving TENDERS for CANNEL and Best Screened GAS COAL, to be supplied for a period commencing the 1st of September next, and to be delivered free at the Chorley Railway Station, or if carted, at the Gas-Works, Water Street, Chorley, as may be required.

Sealed tenders, endorsed "Tender for Coal," specifying the description of cannel or coal, the pits at which they are to be raised, the quantities proposed to be supplied, and the period of supply, to be sent to the undersigned, on or before the 18th of February next, stating also cash terms for monthly payments.

The Commissioners do not bind themselves to accept the lowest or any tender, but the person or persons whose tender may be accepted will be required to execute an agreement for the due performance thereof.

By order,

RICHARD JACKSON, Clerk to the Commissioners.

6, High Street, Chorley, Jan. 25, 1879.

TO BUILDERS, CONTRACTORS, IRONFOUNDERS, AND OTHERS.

THE Salford Corporation are prepared to receive TENDERS for the carrying out of the following Works at No. 2 Gas Station, Regent Road, Salford, namely:—

CONTRACT No. 13.—For the Erection and Completion of Boiler and Pump-Houses, Fitting and Smith's Shop, and Governor-House.

CONTRACT No. 14.—For the Extension of the present No. 2 Retort-House, and Building new Chimney, Boundary Walls, Tar and Liquor Wells, &c.

CONTRACT No. 15.—For the Supply and Erection of Two Cast-Iron Tar and Ammoniacal Liquor Cisterns and Beams.

CONTRACT No. 16.—For the Supply and Erection of a Retort-House Roof, 68 feet span, also a Boiler-House Roof, 29 feet span.

CONTRACT No. 17.—For the Supply and Fixing of Three Wrought-Iron Steam-Boilers, 7 feet diameter and 24 feet long.

The whole to be executed in accordance with plans and specifications, which can be seen, and all necessary information obtained from the Engineer, Mr. S. Hunter, C.E., Gas-Works, Lamb Lane, Salford.

Tenders, sealed and endorsed "Tender No." 14, 15, 16, or 17, as the case may be, must be delivered to me on or before the 7th of February, 1879.

The Corporation do not bind themselves to accept the lowest or any tender. By order,

CHRIS. MOORHOUSE, Town Clerk.

Town Hall, Salford, Jan. 23, 1879.

WESTON-SUPER-MARE GASLIGHT AND COKE COMPANY.

TO BE SOLD BY TENDER, a quantity of GAS PLANT suitable for a medium-sized Gas-Works, consisting of a 30 ft. Gasholder, together with one Station-Meter. Capacity, 5000 ft. per hour, with three 8-in. Valves and connections complete.

Set of Six PURIFIERS, 9 ft. by 6 ft., and 3 ft. 6 in. deep, with Trays and two Centre Valves complete. Two Columns, two Guides, and frame belonging thereto.

One SCRUBBER, 8 ft. by 7 ft., with Iron Trays, Centre Table, and other necessary connections.

One 8-in. GOVERNOR, and also a quantity of piping and other miscellaneous articles.

The above are to be disposed of in consequence of recent extension and enlargement of the works.

Tenders to be sent addressed to the Secretary, and the Directors do not pledge themselves to accept the lowest or any tender

For further particulars apply to Mr. John Perry, Manager, or to

W. H. DAVIES, Solicitor, Secretary.

THE GASLIGHT & COKE COMPANY.

Chief Office, Horseferry Road, Westminster, S.W., Jan. 28, 1879.

NOTICE is hereby given that a HALF-YEARLY ORDINARY GENERAL MEETING of the PROPRIETORS of this Company will be held at this Office, on FRIDAY, the 14th day of February next, at Twelve o'clock (noon) precisely, to transact the usual business, including the declaration of a Dividend for the half year ending the 31st day of December last; and to elect Directors and Auditors in the place of those who will at such meeting go out of office, in compliance with the Company's Acts or Schemes of Amalgamation.

Notice is hereby also given that at such meeting the Directors will apply to the Proprietors for authority, in pursuance of the powers of the Company's Act of 1876, to raise a sum not exceeding £250,000 further capital, by the creation and issue of new ordinary stock, and to exercise the borrowing powers of the Company in respect thereof by raising a sum not exceeding £250,000 on mortgage, or by the issue of debenture stock; also for authority to dispose of such further portion of the Company's property as is not now required for the purposes of their undertaking.

Notice is hereby given that, pursuant to the Standing Orders of both Houses of Parliament, an Extraordinary General Meeting of the said Proprietors will be held at the same Office immediately after the said meeting, when a Bill to be introduced into Parliament, entitled "A Bill for amending The Gaslight and Coke Company Act, 1876, and for other purposes," will be submitted to the Proprietors then present, either in person or by proxy, for their approval. By order,

JOHN ORWELL PHILLIPS, Secretary.

AMMONIACAL LIQUOR.

MESSRS. Cotton and Mardon are pre- pared to receive TENDERS for the whole of the AMMONIACAL LIQUOR produced at the Uxbridge Gas-Works for One year from Feb. 1, 1879.

Contractors to state price per 1000 gallons, from 6 degrees Twaddell and upwards, delivered into boats on the Grand Junction Canal along side the Works.

C. and M. do not bind themselves to accept the highest or any tender.

Gas-Works, Uxbridge, Jan. 27, 1879.

AMMONIACAL LIQUOR.

SPENCE and STEUART, Frizinghall, near Shipley, YORKSHIRE, are Purchasers of above.

PRICE'S PATENT COKE & COAL BARROW

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See Page 173.

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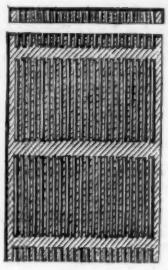
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WITH TAPER OR PARALLEL BARS,
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SCRUBBERS FILLED WITH BOARDS,
On our approved principle, for the extraction of Ammonia.
Prices on application. References to First-Class Engineers.
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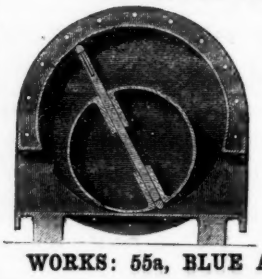
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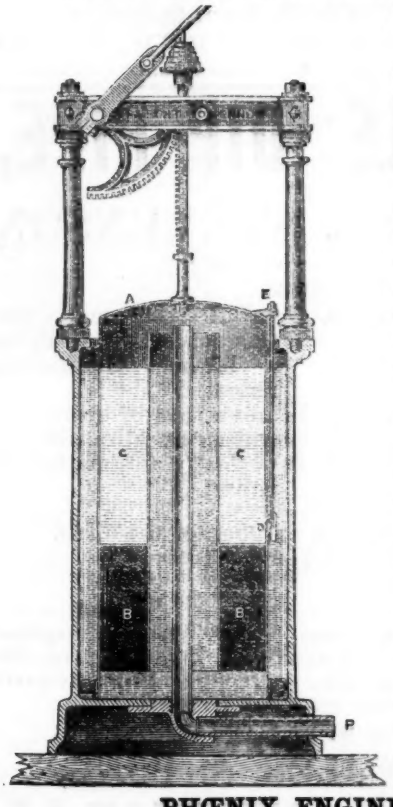

DESCRIPTION OF THE APPARATUS.

The illustration represents a section of the Patent Governor. The lower part of the Bell A is fitted with a loose Float B, and in the upper part of the Bell is a deep annular Water Chamber C, at the bottom of which is an opening D, with a slide outside regulated by a Screw Spindle E, to allow the water to pass in and out of the Chamber C quickly or slowly, according to circumstances, but when once adjusted the slide does **not require altering.** This Self-compensating Chamber gives great steadiness to the up and down movement of the Bell and effectively prevents the "hunting" motion so common with other Governors, thereby ensuring a more perfect action on the throttle-valve of the Engine **than attained by any other.** The sketch shows the clip lever fixed to work on throttle-valve at an angle, and can work in either direction. P is the Gas Inlet-pipe to Governor.

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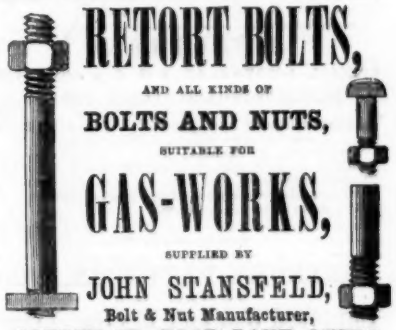

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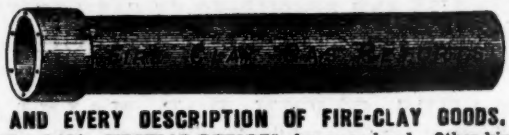
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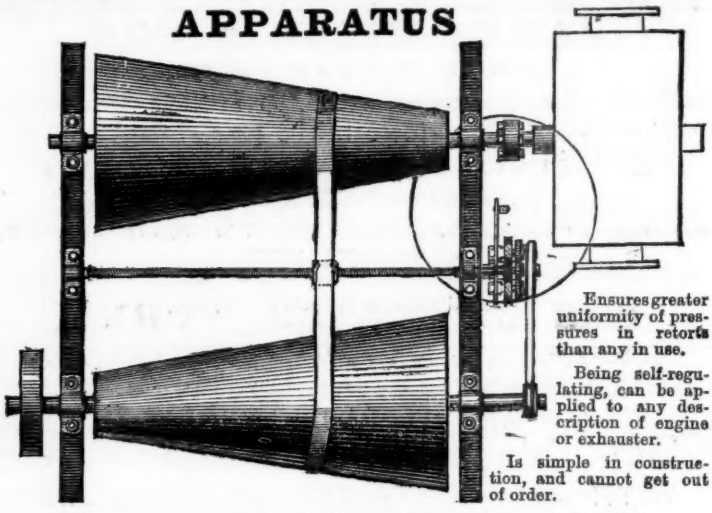
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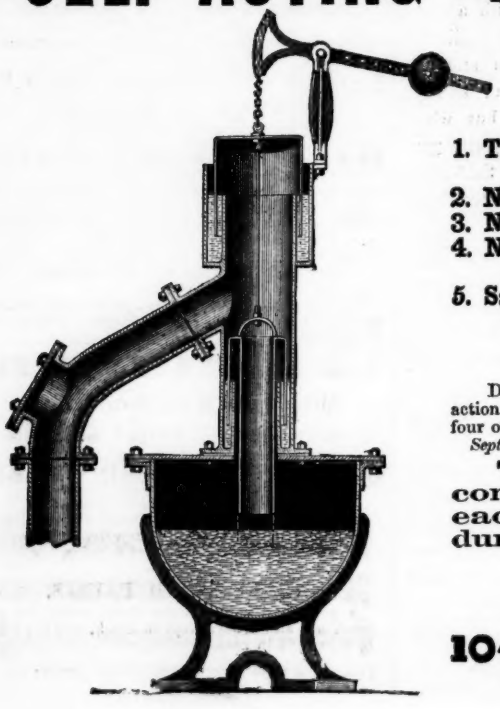

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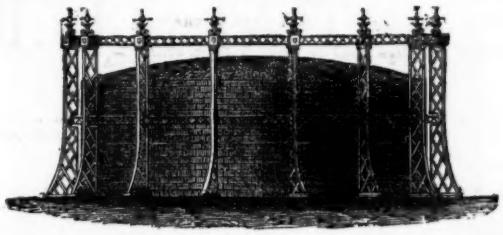

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LIMITED,

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ALSO

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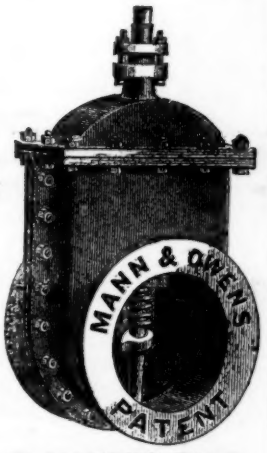
MANN & OWENS' PATENT GAS-VALVE.

EVERY VALVE WARRANTED TO BE PERFECTLY SOUND AND GAS-TIGHT.



VALVE, with Indicator or Above Ground. UNDERGROUND VALVE.

The advantages of this Patent Valve over all others yet introduced are, that it is always as tight as the best wedge or spring valve, without the possibility of setting fast or becoming suddenly leaky. The surfaces not being in contact during the operation of opening or closing, leakage through wear and tear is avoided.

The Gas Engineer will not fail to see the importance of such a valve in connexion with his purifying apparatus, particularly in the case of large sizes.

The slide being operated either by a screw and nut, or by a pinion and rack, a cam bearing upon a plane, cast on the back of the Valve, forces it against the face, and renders the escape of gas an impossibility. By a slight turn of the pinion or screw, the slide is released, and brought away from the face, by which means friction is avoided, and the only force required to open the Valve is that due to its own weight.

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PRICES, SIZES, AND FULL PARTICULARS ON APPLICATION.

YEO'S PATENT ENGINE PACKING,

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Tarred & White Spun Yarn for Pipe Joints, at various prices.

Samples and testimonials free per post.

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AND

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Keep in London and at their works large stocks of PIPES and CONNEXIONS (1½ to 36 inches in diameter); also make and supply Retorts, Tanks, Columns, Girders, Special Castings required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

CHARLES HORSLEY, Agent.

THE

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Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.

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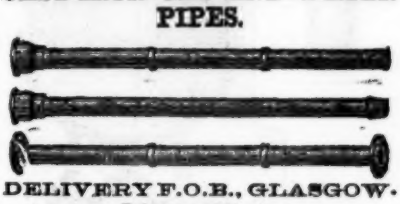
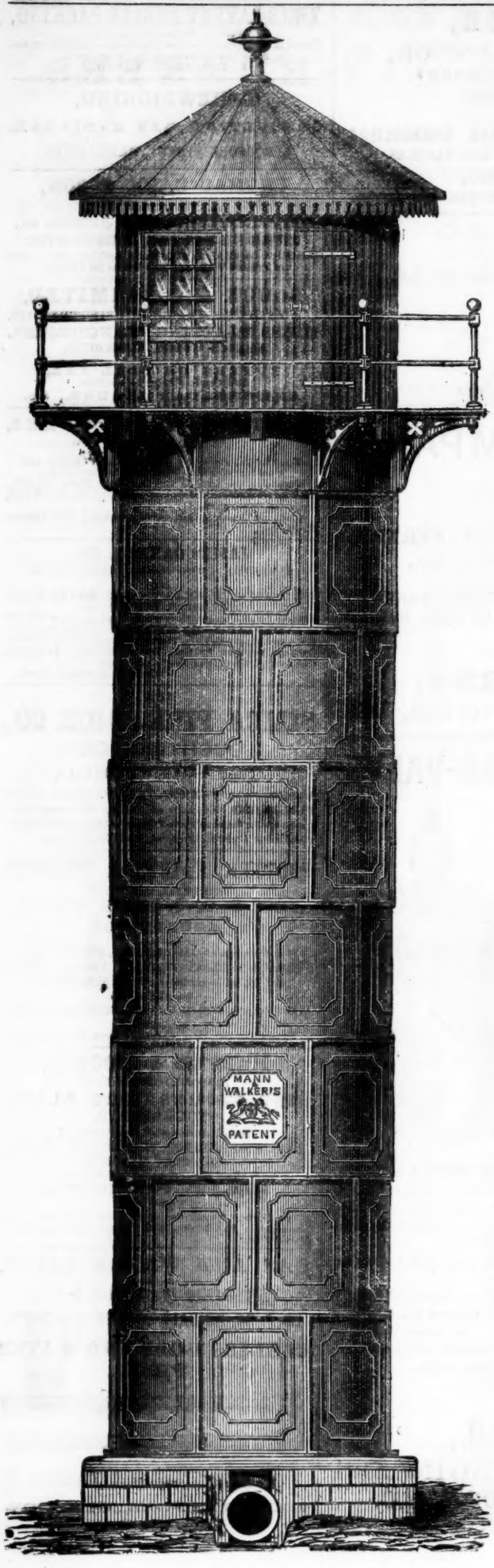
CAST-IRON GAS AND WATER PIPES.



DELIVERY F.O.B., GLASGOW.

Prices on application.



C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the im- portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, re- quiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.